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ABSTRACT

Presented is an evaluation of a leadership training program to prepare junior high school teachers to use the Introductory Physical Science Curriculum. Emphasis of the leadership program is on administrators and their problems, leaders and their problems, and teachers. Recommendations are given. Included in the appendices are sample letters of contact to local school systems, copies of instruments, and the chi-square tabulation. (SA)

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AN EVALUATION

OF THE LEADERSHIP PROGRAM

AND

SOME ASPECTS OF COURSE IMPLEMENTATION

OF IPS AND PS II

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MARCH 1972

SE 029 525

FOREWORD

One of the crucial factors in the success of educational reform is the availability of local leaders who will set a personal example in their own classrooms and serve as a resource for others. In recent years the Physical Science Group has been engaged in training such leaders to help implement Introductory Physical Science (IPS) and Physical Science II (PS II) through local workshops. Since other groups across the country are also engaged in leadership training, it was considered desirable to try to evaluate the effectiveness of our program with the hope that the knowledge and understanding of both our successes and our failures will be helpful not only to us but also to others in the planning of future leadership programs.

The two courses, IPS and PS II, are similar in style and philosophy but have very different characteristics when it comes to implementation. The major difference is that IPS, as a one-year course in physical science, has a well-established slot in the curriculum, whereas PS II as a second-year course does not. The need to learn how to introduce changes in curriculum structure, and not merely in content and methodology, hardly needs elaboration. An evaluation of our leadership program offered a good opportunity to study the problems of the implementation of PS II as a course which requires a structural change in the curriculum. Thus this study is addressed to the assessment of the leadership program and to the problems faced in the implementation of PS II due to the structural change it requires in the curriculum.

This study was carried out by persons who had no part in the leadership program: Maureen K. Oates, Deborah Ditillo, and Robert W. Estin. Mrs. Oates and Miss Ditillo joined the Physical Science Group on a part-time basis for the duration of the study, and Dr. Estin joined the Group shortly before the beginning of the study. Mrs. Oates, who has a rich

experience in program evaluation, was responsible for the planning and direction of the study, and for the writing of this report. She was assisted by Miss Ditillo and Dr. Estin in the site visits and the analysis of the questionnaires. The role of other members of the Physical Science Group was limited to describing the goals of the leadership program and providing background information on the nature of IPS and PS II.

I wish to express my appreciation to the several school systems that collaborated on this study and to the many teachers who responded to the questionnaires. They were given a pledge of anonymity, limiting us to a general statement here.

It is a pleasure to express my gratitude to the evaluation team for the thorough manner in which they have done their work.

This report was produced by Benjamin T. Richards, the illustrations were done by George Frigulietti, and camera copy typed by Caroline Russell.

The IPS and PS II leadership program, including this study, was supported by the National Science Foundation.

Uri Haber-Schaim
March 1972

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I. INTRODUCTION

A. IPS and PS II Course Development

Work on the IPS program started in the early months of 1963 with the object of producing a one-year course in physical science aimed primarily at the junior high school level. This course provided an alternative to the traditional general or physical science offering that was welcomed in many school systems throughout this country and in other nations as well. During the first few trial years, the IPS program showed that it was serving the two groups for which it was designed: students who plan to take further courses in biology, chemistry, and/or physics in senior high school, and those for whom the IPS is terminal.

As the use of IPS began to spread, questions like "Where do we go from here?" and "How about more science in the same spirit?" were being asked by teachers with increasing frequency. This was the stimulus for creation of a course to follow IPS.

In thinking about such a course, it was decided right from the beginning that, like IPS, it should be aimed at a broad spectrum of students, including those who would normally terminate their study of sciences with high school biology. It was felt that the majority of students did not get a sound basis in physical science either for general education or for use in further science courses. The one year of IPS replacing general science helped, but it was not enough. The second year of physical science was proposed to extend the content for students needing or wanting more work in the subject.

The philosophy underlying both programs made interaction with others in investigations, discussions of data, and development of further work the basic component of the science course. Improved orientation and attitude toward science and the acquisition of fundamental skills were primary objectives.

The IPS and PS II courses gave their developers experience with both the successes and the problems of curriculum innovation; IPS as a widely accepted improvement in the existing curriculum, and PS II as an innovation

which did not find such ready acceptance. Figure 1 illustrates the growth pattern of the two courses during their pilot years, based on pilot data and textbook distribution figures.*

The slower growth rate of PS II is apparent. This was due in some measure to the restriction of PS II use to trained teachers during its pilot years. This was accomplished primarily by strict control of distribution of the teacher guides. Some effort to control IPS growth had been made in 1965, but demand for the course was already beyond restraint. Differences in social climate with regard to science education and in the funding of educational innovation when IPS was piloted and when PS II was piloted also had an effect.

B. The Implementation Conferences

Near the end of the pilot phase of IPS, the problem of providing materials and training teachers for a completely new course became a matter of concern. It was necessary not only to equip classrooms for a laboratory-centered course where none had existed, but also to re-orient the role of the teacher in the classroom from one of source of knowledge to one of guide in learning. One step was to acquaint administrators as well as science personnel with the new program.

To accomplish this, a series of implementation conferences were planned, two in 1965 and one in 1967, to which both regional and local educators were invited. The purpose was to familiarize them with the philosophy and dimensions of IPS and orient them to the new classroom methodology required of teachers using the course. From this, those attending would be able to assess IPS in relation to existing science programs and make recommendations to school systems regarding course adoption and teacher preparation.

The same method of approach to the schools was utilized for PS II, with implementation conferences in February and March, 1970. Figure 2

*The number of students in pilot classes was known directly. In later stages of the IPS pilot program, non-pilot classes also used the materials. These were not monitored directly.

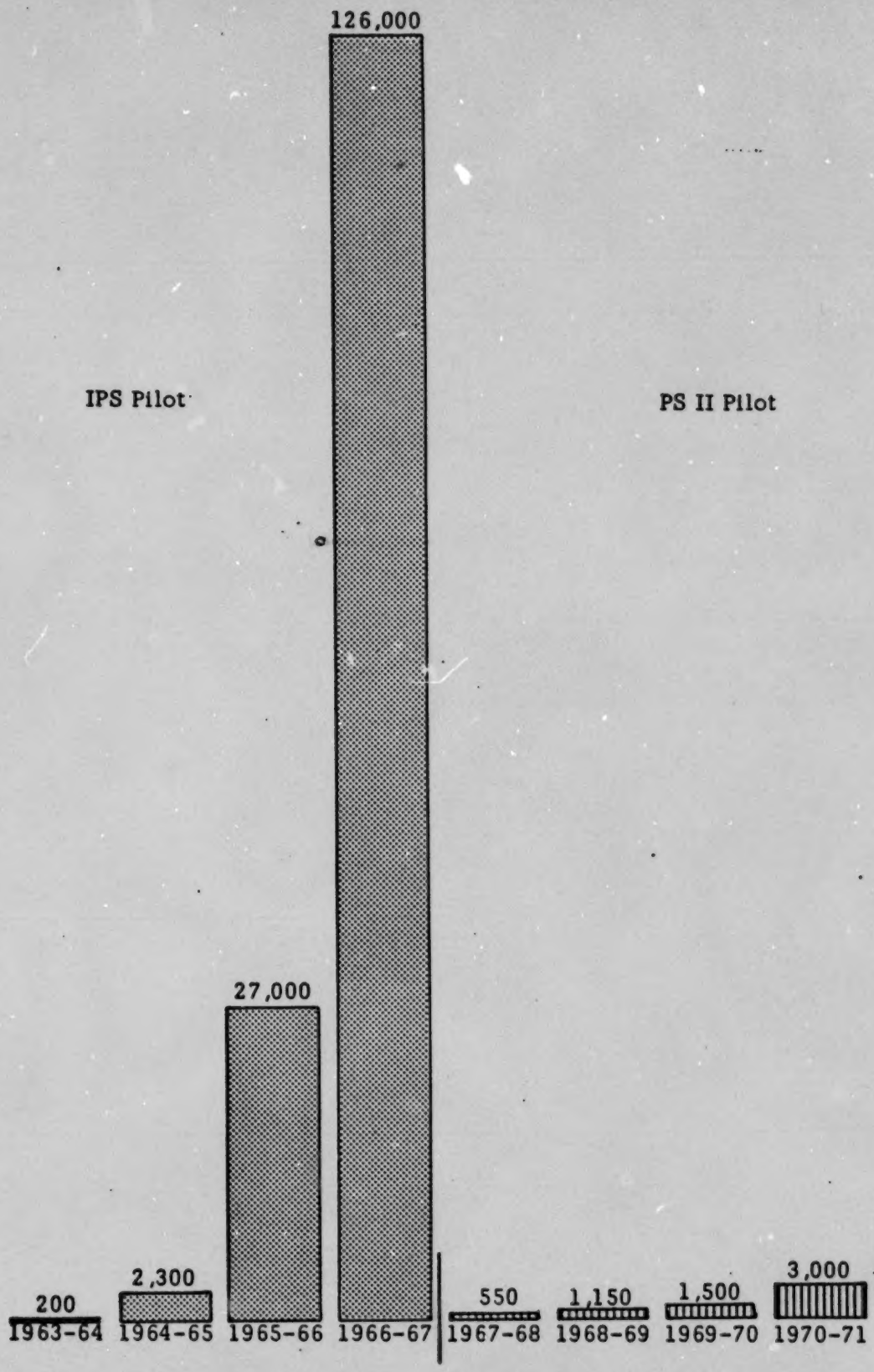


Figure 1. Growth of IPS and PS II During Their Pilot Years

PS II

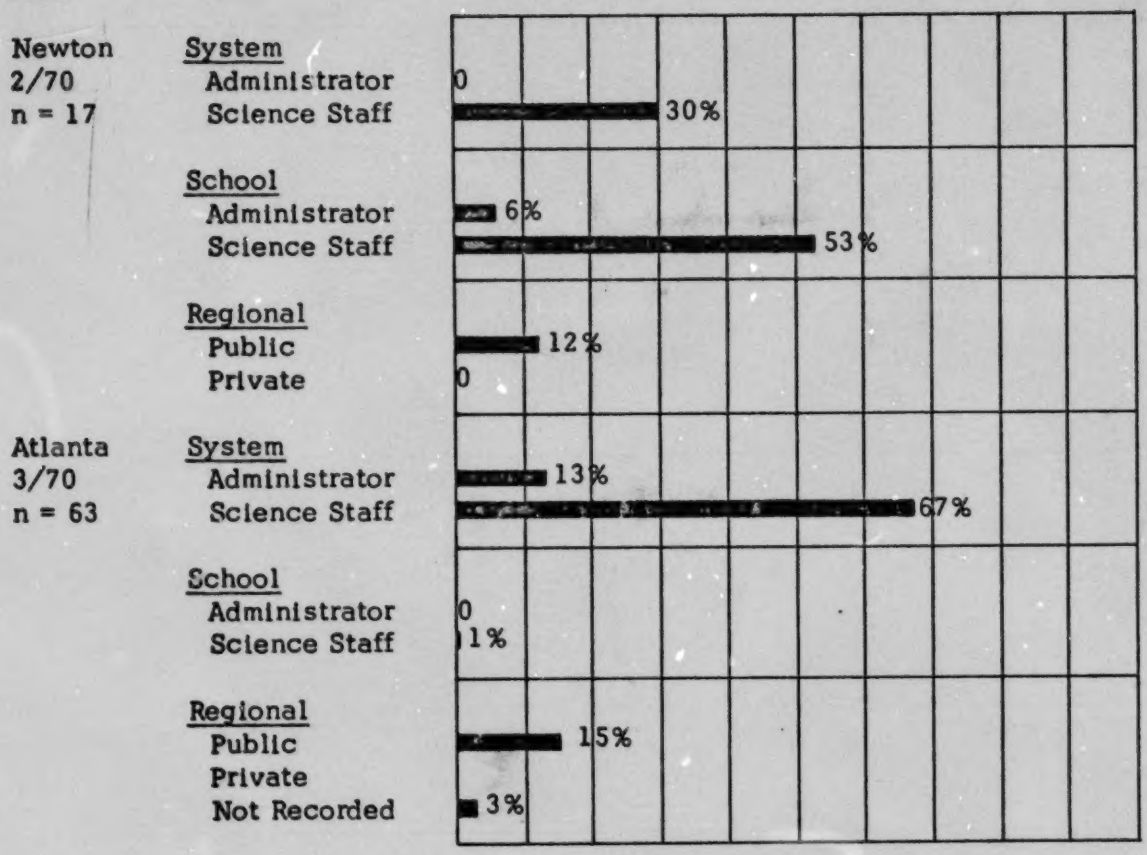


Figure 2(b). Participation in PS II Implementation Conferences

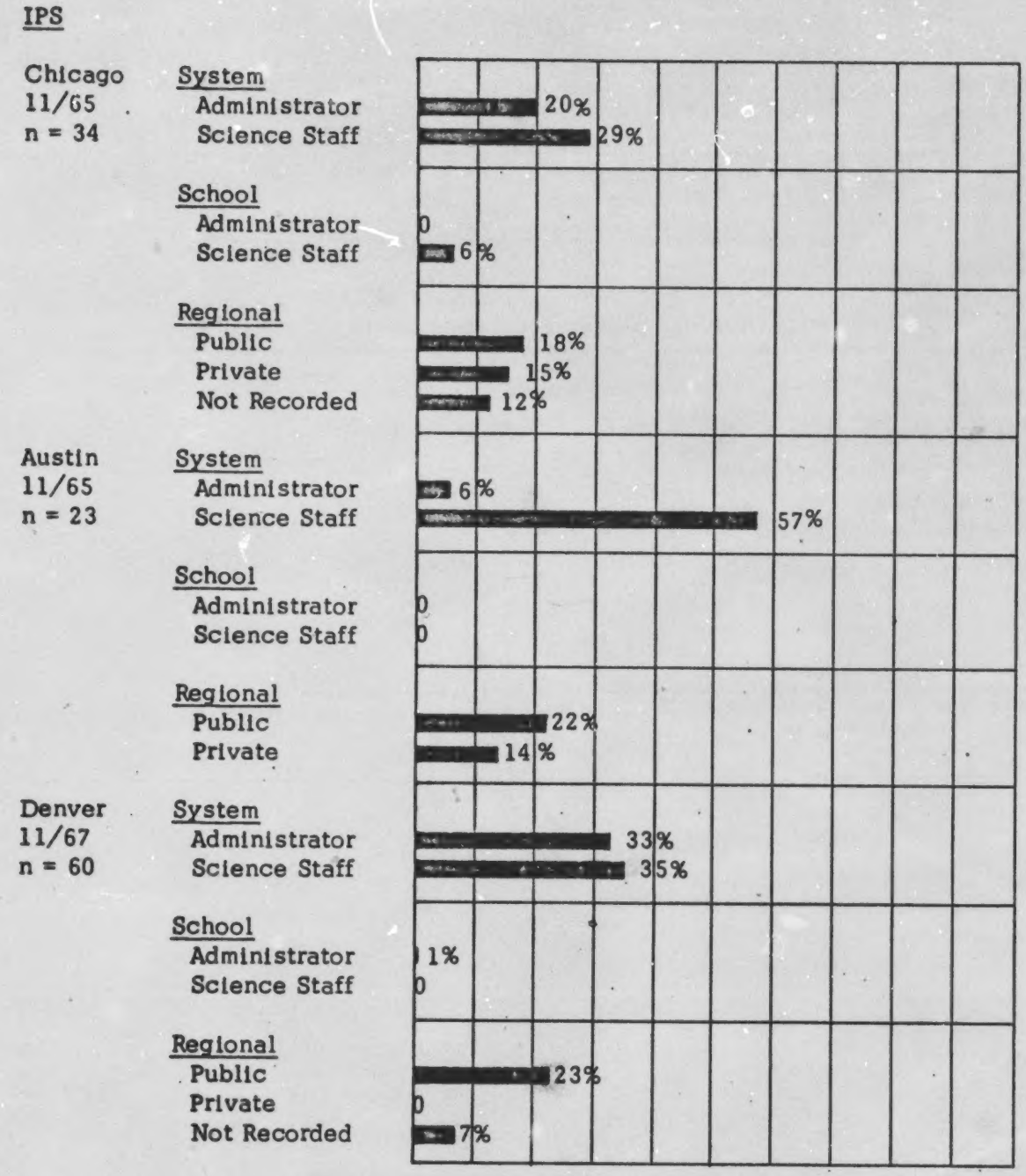


Figure 2(a). Participation in IPS Implementation Conferences

illustrates the participation patterns of these conferences. At the IPS conferences there was a high proportion of system administrators and regional educators. At the Newton PS II conference there was a high proportion of science department heads and teachers from the schools. At the Atlanta PS II conference about two-thirds of the participants were science supervisors at the system level. The Newton conference was regional, while the Atlanta conference was national.

Each conference lasted two days. Pilot teachers were present to supplement the presentations of the Physical Science Group with their classroom expertise. All of those attending the PS II conference were previously involved with IPS.

In-service work with teachers was an important component of this curriculum development project from the beginning through summer institutes, academic-year programs, and local workshops. Following the IPS implementation conferences, widespread adoption of the course led to a need for more effective models for this aspect of professional development.

Teacher preparation in IPS emerged as a task of major proportions. A leadership training program was proposed to meet this need, and was funded by the National Science Foundation.

C. Overview of the Leadership Program

Training of teachers through their peers and in their own environment was the basis for the leadership training program. The staff of successful summer institutes usually included both college faculty and high school science teachers with actual course experience in the classroom. Since the local workshops could have only one instructor, the Physical Science Group believed that the first-hand classroom experience of a teacher was more important than the subject-matter expertise of a college instructor. They held that the quality of personal interactions in the workshops was of greater importance than depth of the leader's science background.

The possibility of training local IPS and PS II teachers to run local and regional workshops for teachers in their areas was explored for two

reasons. One was that local leaders could share with their peers their understanding of school situations and student problems along with background in IPS or PS II. The other was that the need for training programs for IPS teachers had exceeded the capacity of the summer and in-service institutes to provide it.

In 1968 and 1969, the National Science Foundation supported two conferences for the Physical Science Group to provide training for leaders to enable them to teach IPS and to organize and run local and regional workshops for the IPS training of teachers in their own school districts or regions.

Late in the spring of 1968, information notices on the leadership program were distributed to school districts which had reported a need for trained IPS teachers. In addition, the publishers of the IPS text book distributed notices and application forms to teachers in schools adopting IPS for the '68 - '69 school year. Potential participants in the program submitted applications in which they indicated their teaching experience, commitments to teach IPS in the ensuing school year, plans for a local IPS workshop for other teachers, and ability to participate in the total program. In each case, the participant's school district was requested to present a letter indicating a willingness to support the individual in the organization of the local workshop.

After 114 applications had been reviewed, 87 teachers were selected to participate in a summer Leadership Conference held at the Colorado School of Mines in Golden. Seventy-eight teachers accepted the invitation to participate in the conference to begin in mid-June. They received no stipend for the 2-1/2 week conference, but were provided round-trip transportation from their respective home towns, room and board, and miscellaneous expenses.

In addition to full days divided between classroom and laboratories, small group conferences were scheduled to complete the details of the local workshops which the newly-trained leaders were to conduct. The schedule for these local workshops was set at five full days' instruction prior to the opening of school, and ten full days during the academic year. In a few cases it was necessary to devise a plan involving 15 or 20 partial day sessions, but in all cases the local workshop was designed to meet for a minimum of 100

hours of instruction. This amount of time was found to be essential to effect the necessary change in teacher philosophy and methodology, based on previous workshop experience of the Physical Science Group.

A second IPS Leadership Conference was held in Atlanta, Georgia, in the summer of 1969. By this time information on the PS II course had become available. Since there were applicants who expressed a desire to become familiar with it, a small PS II section was organized in addition to the IPS conference. Forty-eight leaders were involved with IPS and eight with PS II.

In the summer of 1970, a Leadership Conference for PS II alone was held in Newton, Massachusetts, for 14 leaders.

D. The Evaluation Study

The need to evaluate various aspects of new programs has become increasingly apparent with multiplying course offerings. This study is primarily concerned with course implementation through the leadership program, focusing on these two questions:

1. How effective is the leadership training program in IPS and PS II in terms of
   a. teacher development in the spirit of the program?
   b. preparation of teachers with limited science background?
2. What are the implementation problems of a course like PS II, which does not have a niche in the existing curriculum structure, in comparison to a course like IPS, which does, with regard to
   a. method of approach to schools?
   b. the various organizational structures of junior-senior high schools?
   c. involvement of guidance and administrative personnel?

The question of what types of workshop leaders are most successful was also raised, but due to limitations of time and personnel, an analysis of the characteristics of the successful leader was not undertaken.

II. PROCEDURES

A. General Plan of the Study

A study of national scope was planned, which included: 1) mailing of questionnaires to participants in IPS and PS II workshops conducted by trained leaders; 2) an in-depth study of three IPS and three PS II workshops, with site visits to observe both workshop leaders and participants in their classrooms.

Work on the evaluation was started in September 1971, with a December 31 termination date. This meant that data had to be gathered and sites visited after the school year was well underway in October, and before the Christmas vacation period. Staff consisted primarily of a part-time evaluation consultant, a research assistant, and major blocks of time from one Physical Science Group staff member who was not involved in the leadership program.

B. Instruments

Three instruments were developed

1. Questionnaires: a long form consisting of 50 items was prepared for leader response, and a slightly different version with 45 items for non-leader response.

   (Leader has attended an IPS or PS II Leadership Conference, taught IPS/PS II for one year, and is prepared to run workshops. He may or may not be teaching currently.

   Non-leader is an IPS or PS II teacher, who may or may not have been a participant.

   Participant is a teacher who has attended a local IPS or PS II workshop run by a leader.)

   It should be noted that the non-leader group contains over 85 percent of participants, the balance primarily PS II teachers who were not participants in leadership workshops.

2. The interview schedule: this form outlined 30 questions to be used on site visits with teachers, supervisory personnel, and administrators.

3. Classroom Observation Forms: a general form was developed for background on the class, plus separate forms for pre-lab, lab, and post-lab, providing keys to teacher and student behavior to be observed.

The questionnaires were used on a trial basis with an IPS workshop group. The observation forms were field-tested in a local school system by the three people who would be doing site visits. After revision, the three observers-to-be also used these forms in a one-day training session, using films of IPS classes, to develop a mutual perception of the IPS philosophy in action. Copies of these instruments are included in the appendix together with sample cover letters that accompanied the questionnaires.

Leadership questionnaires were stamped with a code indicating which conference the individual had attended, and return envelope was stamped with the same code. The participant questionnaires (short form) were number-coded to correspond with the workshop taken, and also sent out with a return envelope. Since it was apparent that PS II returns would be sparse, an additional list of likely PS II users was prepared on the basis of requests for Teacher's Guides and book sales records, and questionnaires were sent to these individuals. Mailings and returns are recorded in Table 1. The total of 320 respondents represents 169 school systems.

TABLE 1
QUESTIONNAIRE MAILINGS AND RETURNS

		No. Sent	No. Returned	%
Leaders:				
First Mailing (long forms)	Oct. 10	147	68	
Second Notice (short form)	Nov. 20		13	
Cut-off date	Dec. 15		81	55
Non-leaders:				
Participants (short form)	Oct. 20	500	204	41
PS II Mailing (short form)	Oct. 25	52	35	67
Cut-off date	Dec. 18		239	

C. Site Visits

Concurrently, site visits were arranged on the basis of workshop information in the Physical Science Group files, contact with selected leaders by letter and telephone, and the time factor. Certain difficulties rapidly became apparent, particularly with regard to PS II site visits. Two PS II workshops had been conducted in 1970-71, and two more were scheduled for 1971-72. Of the two current workshops, contact with the leader of one indicated that the workshop was discontinued in the fall, due to implementation problems. The other was located in Canada and so was not considered for visitation. Thus there were no sites available with a PS II workshop in session, and only two sites where leaders had held workshops during 1970-71.

Timing of visits required skill and tact. In one system logistics problems of course implementation on a system-wide basis had caused delays in getting classes underway. In another lack of administrative support for in-service programs had prevented the workshop from progressing on schedule. With regard to PS II, where review and completion of IPS make the introductory portion of the course, there was some reluctance to be visited until they were on to "the real PS II." Thus scheduling of visits took diplomacy as well as coordination.

Three sites were selected where leaders are currently conducting IPS workshops; one site with all participants and the leader from the same school system; one site involving teachers from three systems including the leader's own; and one site with a leader from outside the system. The two sites where the leader ran a workshop in 1970-71 and PS II is currently taught were included in the schedule. These sites were visited in succession from mid-October through the first week of December. Nine school systems took part in this aspect of the study.

Two persons visited each of the five sites. An attempt was made to have each IPS or PS II classroom visited by the two people in order to cross-check perceptions. However, at some sites schools were located so far apart that it became a matter of practical necessity to divide personnel to cover the area. Thus, visits by only one person were possible in a given school in some

instances. There was also an attempt to visit the different IPS or PS II classes of a given teacher in order to assess the implementation with different groups of students. For the most part, this meant that one observer saw the teacher with one class and the other observer saw the teacher with another class of perhaps different ability levels. Table 2 illustrates these visitation patterns and shows the proportion of IPS to PS II teachers and classes visited.

TABLE 2
NUMBERS OF VISITS TO CLASSROOMS

	IPS		PS II	
	No. of Teachers	No. of Classes	No. of Teachers	No. of Classes
One observer, one visit	19	19	1	1
One observer, two visits	1	2	1	2
Two observers, one visit each	15	28	7	11*
Two observers, two visits each	--	--	2	8
Two observers, three visits each	--	--	1	1
Totals	35	49	12	28

*In some instances a teacher was observed once in IPS and once in PS II classes.

Interviews of teachers, supervisory personnel and administrators were conducted in the schools visited wherever possible. Table 3 tallies the number of interviews of the various personnel. In the five instances when an interview was not possible, a form was left for the individual to complete and forward to the Physical Science Group.

TABLE 3
NUMBERS OF INTERVIEWS AT SCHOOL SITES

	IPS	PS II
Superintendent or Assistant	4	1
Coordinator of Science	5	--
Workshop Leader	5	2
Principal or Assistant	15	2
Department Head	6	3
Teacher	34	5
Totals	69	13

D. Analysis

As site visits were completed, the observers involved put the observations and interview information into a case study report on each system. These are available in the files of the Physical Science Group for in-house use. An overview of site visits is included in this report and material from the case studies is utilized in the analyses when so indicated.

Tally forms were developed for questionnaire data, and responses were tabulated as the forms were returned. Five questions with answers in commentary form were selected for further analysis.

Analysis of the effectiveness of leadership training is based on classroom observation data and commentary, plus questionnaire data. Analysis of the implementation of PS II is based primarily on questionnaire data plus information obtained in the interviews. The classroom observation data has lesser relevance for the implementation analysis.

III. THE LEADERSHIP PROGRAM

A. Administrators and Their Problems

1. Administrative Support

When the leader has completed his training and returns to his school system, eager to provide workshops in IPS or PS II, he may encounter situations he does not anticipate. In the variety of situations observed, administrative support ranged from the central office strongly supportive of new approaches to science teaching from the superintendent on down, to the weak central office hardly aware of the science offerings, much less the particular philosophy of IPS.

The involvement of administrators in IPS and PS II adoption was analyzed on the basis of interview comments recorded on site visits. Six central office administrators including superintendents, assistant superintendents, and directors of secondary education were interviewed, plus 15 principals and assistant principals. Table 4 presents a summary of their comments on four items.

TABLE 4
INTERVIEW COMMENTS FROM ADMINISTRATIVE PERSONNEL

	Central Office n = 6	School n = 15
Personal role in IPS/PS II implementation	5 no role 1 active role	13 no role 1 supportive 1 active role
Cost of implementation seen as factor	3 no 2 yes 1 no comment	10 no 4 yes 1 PS II no
Fit of IPS/PS II into curriculum	5 fits well 1 qualified response	11 fits well 4 qualified responses
Difference apparent between workshop and non-workshop IPS and PS II teachers	4 yes 1 no 1 no comment	5 yes 1 no 2 non-committal 7 no comment

For the most part, neither central office nor school administrators saw themselves as directly involved in implementation of new courses. Their comments generally indicated that they expect initiative to be taken by the specialists in a given field, and their own role is endorsement of suitable curriculum development projects. Cost of implementation troubled the central office somewhat more than it troubled principals, but did not seem to be a problem in the majority of schools visited.

Comments on how well the physical science courses fit into the curriculum seemed to reflect feedback from staff more than personal awareness on the part of most administrators. For example:

"I'm getting positive reactions from teachers and students."

"It appears to fit well. Kids are involved."

"It has taken over the science program at the 9th grade."

"Well, it's better than what we had before."

"The science department is satisfied."

"I'm not aware of any complaints."

In some systems the science coordinator, or in smaller systems the department head, had primary responsibility for innovation in the science curriculum. In some instances an individual teacher was the moving force in the introduction and implementation of IPS. But without an understanding on the part of the administration about the dimensions of the course, the individual teacher, department head or workshop leader had a variety of difficulties. Areas affected included facilities; funds for books, equipment and materials; support for in-service programs; classroom atmosphere; and scheduling problems.

2. Facilities

In the classrooms visited, observers saw some excellent facilities and some barely adequate, where there was no running water, haphazard storage, too many lab tables for teacher and students to walk between rows. The quality of teaching did not seem to be directly related to the quality of facilities. In the aware systems, steps are being taken to remedy problems, but in some cases there is little prospect of improvement. This is due in part to lack of funds for needed remodeling, and in part to lack of administrative concern.

3. Financial Support

More than half of those interviewed stated that funds needed to introduce and implement IPS were not a problem. Some now experience difficulty with replacement costs, and they anticipated more difficulty as budgets become tighter. Many felt it would not be as easy to introduce IPS currently, for costs reasons alone. There was more awareness of budget problems affecting PS II where it was offered.

To some extent, administrators view the problems differently from teachers. As assistant superintendent commented on budget problems in terms of timing: "It's a matter of minor internal confusion, need for lead time on a new program. There is always money available when the Board is informed."

Regarding budget problems, a department head stated: "We had to show justification for IPS. Having done so as a pilot (trial use), then it went well."

A principal reacted with this remark: "Obviously there are such problems! The year of pilot (trial use) was a 'year of austerity'."

The classroom teacher was more apt to comment on replacement problems and competition with other courses for funds. One stated: "There is an allocation of $18.00 per student for the whole school, and it's getting worse. Consequently, IPS and Earth Science suffer!"

Another pointed out her difficulty in obtaining enough books and replacing broken equipment, in a school where the principal stated: "There is no problem here. The last thing the school board wants to hear is that there aren't enough books to go around." The breakdown in communication was due to a department head uninformed about IPS and PS II.

4. In-service Programs

Support for in-service programs varied from wholehearted recognition of their value in orienting teachers to the IPS philosophy and developing confidence in use of a more open approach to denial of the necessity for them. Usually, the science coordinator or department head acknowledged the need. However, in one system the department head felt that any science teacher should be able to teach any science course without special training, and influenced the administration to think the same. Where there was informed interest in the science program in the central office or on the part of the principal, a well-organized in-service program was supported. The principal seemed to be a major positive influence in only one system, but did give nominal support in most schools.

In commenting on differences between workshop and non-workshop teachers with IPS and PS II classes, administrators who did perceive a difference were positive in their remarks. They made statements like this:

"There is no comparison. Anyone teaching a new science needs training."

"Of course there is a difference. I wouldn't adopt the course without a workshop."

"Trained teachers are more secure with the course, more effective." ... "more enthusiastic."

Those who did not report a difference stated that they were "not aware" of differences in the teacher's performance.

5. Classroom Atmosphere

Whether classes were seen as "disruptive" was a matter of definition for the most part. In some of the schools, public as well as private, an atmosphere of respectful quietude prevailed, and was associated with some degree of constraint in the IPS classes. In other, more open schools, reasonable commotion associated with learning activities was deemed "a good kind of noise." In several of the schools, one or two teachers were known to be critical of the "messy, disorganized" science class of an IPS colleague. But the observers took note of only one such class with a workshop teacher.

6. Scheduling

Scheduling problems existed almost everywhere. A double class period for lab once a week was not especially useful for IPS/PS II since it seldom came when most needed. In systems where the daily class schedule provided a reasonable time period, there were complaints about too many conflicts with assemblies, interruptions for announcements, fire drills, etc. Lack of time between periods was a cause for some distress.

7. Sequencing of PS II

More serious complaints were related to scheduling students with no IPS into PS II classes. In two of the four systems using PS II, administration and/or guidance looked upon it as an independent course, and did not require or advise students to take IPS first. This resulted in mixed classes in which student background varied from none at all to a well-developed understanding of the physical properties of matter. As one teacher remarked, it would be simpler to plunge into PS II with a whole class without IPS background, even though that may be undesirable.

8. Evaluation of New Courses

We found three instances of administrators conducting their own investigations of course effectiveness. In one junior high a principal had records of absentee rates and failure rates in 9th grade general science and

in IPS, with attendance increasing by 7 percent and failure in science decreasing by 25 percent when IPS was adopted. A leader working with the science supervisor in his system had conducted a follow-up study which showed that 68 percent of IPS students and 30 percent of general science students took chemistry in comparison with 18 percent of the rest of the student body. A more sophisticated study of the entire science program in another system is utilizing the Process of Science Test and the Test on Understanding Science to assess changes in student understanding and attitudes as they go through the program.

9. Summary

To summarize, where a lack of informed administration was found, difficulties related to allocation of funds, support for an in-service program, facilities and scheduling for IPS and PS II, and simple tolerance for the less traditional classes were apparent. While some of these difficulties existed at all sites visited, the kind of awareness and concern expressed by administrators seemed to be the crucial factor in dealing with them.

B. Leaders and Their Problems

1. Role in the Schools

From the preceding discussion it is apparent that the involvement of administrators is a vital factor in successful course implementation. The interactions of the leader with the school system and with workshop participants are of equal importance. The leader may have missionary work to do within the local school system as well as in providing workshops.

At three of the sites visited, the leader was a strong, positive influence on the administration within his own system and had an indirect influence in his region. As a full-time teacher, he did not have time to open channels of communication with administrators of neighboring school systems. In the other two cases, the role of the leader within his own system was more limited, with strong science supervisory personnel taking active parts in course implementation along with their leader.

With those leaders who clearly had responsibility for the in-service program in their systems or regions, we can state that they were succeeding in providing effective workshops. This is based on observation of teachers trained by them and on the satisfaction expressed by administrators and teachers in the schools affected. This is especially true where the leader had more or less continuing contact with participants and was not limited to the workshop sessions. In two instances the leader not only ran the workshop but served as resource person to workshop participants, including those from outside his own system. This tended to promote good morale and continued professional growth.

In some situations the responsibility was less clear. The leader, while running the workshop in good order, could not always provide supportive services to the participants, either advice or materials, between sessions. In one instance, a science coordinator seemed to feel that this support infringed on his prerogatives, but was incapable of filling the need himself because of unfamiliarity with the program. In some instances, the leader simply did not have time or resources to do this outside his own system. In one situation, the leader was providing only part of the IPS training in his system; a department head was also involved in presenting workshops, and some teachers were trained in NSF Institutes. In this instance it was difficult to assess the impact of the leader on his system.

Leadership response to the questionnaire substantiated these perceptions. Figure 3 indicates that the typical leader had trial-taught* the IPS/PS II courses most often within his own system. He provided workshops in equal proportion for school, system, and region. His leadership role in implementation was greatest in his own school, less in his system, and still less in the region. There were almost twice as many leaders reporting no role in system implementation as there were reporting none in the school. Those reporting no role in the regional implementation were almost twice as many again.

*Trial teaching refers to a limited use of a new course for the enlightenment of the school system, in contrast to pilot teaching for the purpose of curriculum development.

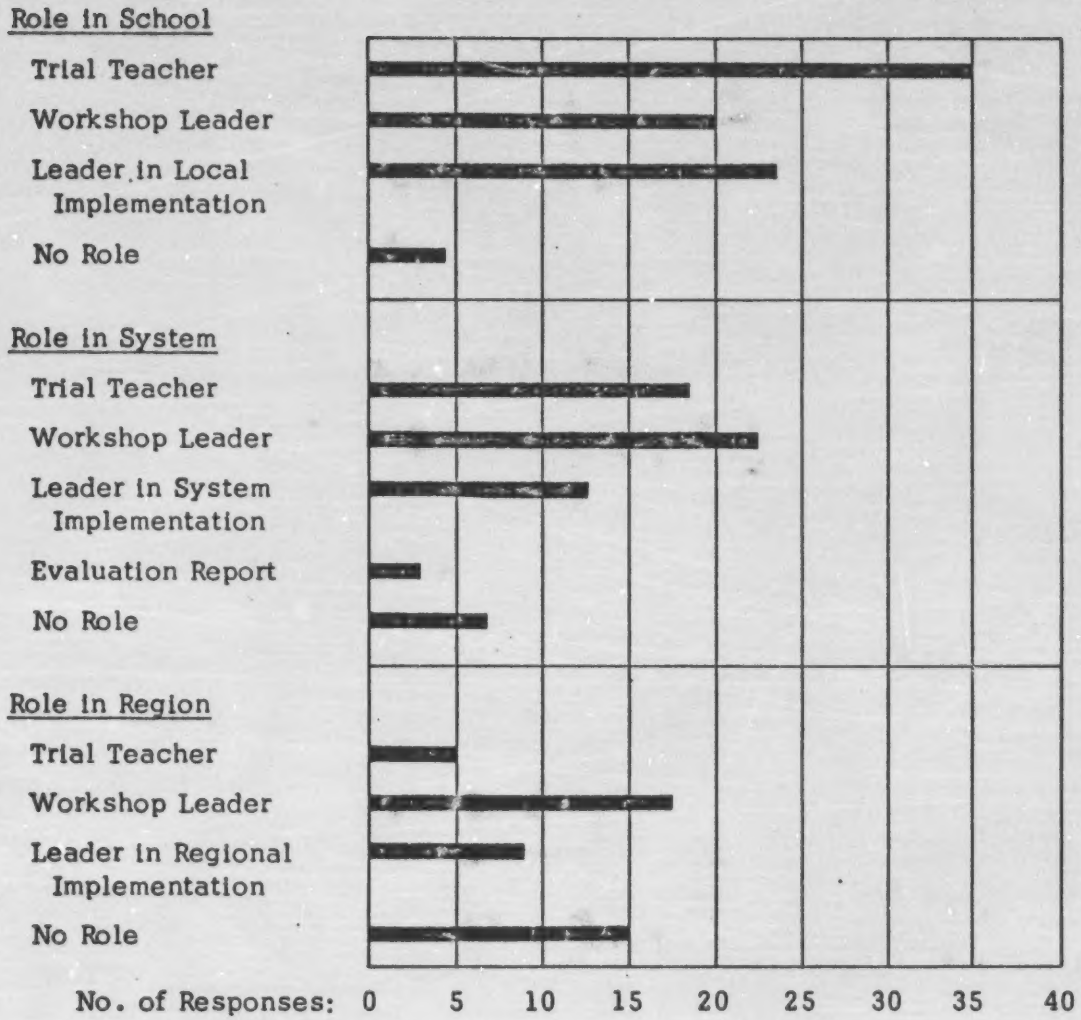


Figure 3. The Role of Leaders in IPS/PS II Implementation

In Table 5, problems in providing training are tallied on the basis of leader response to an open-ended question. From this it appears that there are more difficulties resulting from non-supportive administrators and teachers than from other implementation problems.

TABLE 5
PROBLEMS IN PROVIDING TRAINING FOR
PROSPECTIVE IPS/PS II TEACHERS

	No. of Leader Responses		
	IPS	PS II	Totals
No problems	8	1	9
Lack of Teacher Interest	14	6	20
Lack of Administrative Support	12	1	13
Scheduling Problems	9	4	13
Costs	6	3	9
Other*	4	1	5

*Teacher turnover, disagreement with IPS philosophy, etc.

2. Workshops

Two of the site visits were planned to permit attendance at the workshop sessions. In one there was continuous interaction among the participants in working on experiments and in talking about their own IPS experiences with each other. There was great rapport with the leader, who acted as a resource guide to the group, even though none of the participants were from his school system.

In the other, the participants, all from the same system, were told late in the summer that they would be teaching IPS in September, and came into the workshop with negative feelings. The leader had succeeded in reorienting their attitudes so that they brought interest and enthusiasm, along with some gripes, to the sessions visited. Between the summer sessions and our visit in December it had been possible for them to meet only twice after school for two hours. The session we visited was really a discussion group conducted by the leader, with no experiments undertaken. But the participants were asking for a full day on their own time to do experiments.

These visits provided one example of a workshop functioning in an almost ideal manner, with an obviously effective leader. In the other situation, the workshop was hampered by several of the problems discussed in

the preceding section. The leader was effective in changing the attitude of the participants from hostility to cooperation and even enthusiasm, but was still confronted with system constraints in attempting to provide training for them.

It would take many more visits to assess the quality of workshops provided through the leadership program. Questionnaire data does provide some indications of its success in terms of quantity, and indicates some of the possible sources of variation in effectiveness.

Table 6 records the number of workshops reported by leaders trained in the four conferences. There was a range of from 0 to 7 workshops per leader response. Leaders trained at the Golden, Colorado, conference appear to be the most successful in promoting workshops. But it must be noted that there was more time for them to accomplish this, since the Golden conference was the first.

TABLE 6
NUMBER OF WORKSHOPS REPORTED BY LEADERS TRAINED IN THE FOUR LEADERSHIP CONFERENCES

	Golden 1968 IPS	Atlanta 1969 IPS	Atlanta 1969 PS II	Newton 1970 PS II
No. of leaders trained	78	48	8	14
No. of responses to questionnaire and interview	46	23	5	11
No. of workshops reported	70	24	0	4
No. of workshops per leader response	1.52	1.04	0	0.36

3. Role in Small, Medium, and Large Systems

Most questionnaire responses were grouped on the basis of whether the school system could be classified as small, medium, or large. A small system was defined as having less than 1000 secondary students; a medium system as having 1000 - 5000 secondary students; and a large system as having over 5000 secondary students. Some questionnaire responses did not provide this data. Usually, one system had one leader trained, but there were exceptions in the large systems.

In Table 7, the number of IPS and PS II workshops run in each group is recorded, together with the numbers of participants. The data shows that leaders in small systems have less success in promoting workshops than do leaders in medium or large systems, on the basis of percent reporting "no workshops." The mean number of workshops per leader also indicates this difference, even when the contributions of four outstanding leaders are discounted. This may be due to problems of regionalization to some degree, with contacts in other systems than the leader's own limited by poor channels of communication. In the small systems, the leader must depend on these contacts if he is to have a workshop with more than minimum enrollment. In some of the very small systems, the leader is handling all of the IPS and PS II classes alone, with no need for a workshop.

The totals show the effectiveness of the leadership training program in terms of numbers of workshops provided and teachers trained. The sample total (n = 68) is less than the total of leadership response (n = 81) because not all of the forms contained the information required for this table.

In Table 8, the data shows that there is some correlation between the strength of the leaders in terms of their science background and the size of the system. This is not a significant correlation, but might be explored further. A limited science background is defined as having a non-science major, but a science minor or one or more NSF Institutes. A non-science background is defined as neither a major or a minor in science, nor an NSF Institute.

Within small, medium and large systems, leaders are most successful in implementing the program in medium systems, least successful in small systems. The difficulties of the leader in a small system may be related to problems in bringing together teachers from outside his own system or to the more limited science background of the leaders. However, the large systems have the highest percentage of leaders with strong science backgrounds, and do not have the highest percentage of workshop-trained teachers.

TABLE 7

NUMBER OF WORKSHOPS AND PARTICIPANTS IN SMALL, MEDIUM, AND LARGE SYSTEMS

No. of Leaders		No. of Workshops	No. of Participants	Mean No. of Participants/ Workshop	Mean No. of Workshops/Leader	Leaders without Workshops No.	%
Small Systems							
n = 14	IPS:	9	121	13.4	0.6	6	43
Medium Systems							
n = 25	IPS:	30	499				
	PS II:	1	6				
	Subtotals	31	505	16.3	1.2	6	24
(One leader*)		-4	-147		(4.0)		
Adjusted data		27	358	13.3	1.1		
Large Systems							
n = 23	IPS:	42	779				
	PS II:	3	84				
	Subtotals	45	863	18.2	1.9	4	17
(Three leaders*)		-22	-620		(7.3)		
Adjusted data		23	243	10.5	1.0		
Totals							
n = 62	IPS:	81	1399				
	PS II:	4	90				
	Totals	85	1489	17.5	1.4	16	26
(Four leaders*)		-26	-767				
Adjusted data		59	722	12.2	0.9		

*These outstanding individuals accounted for a disproportionate amount of the workshop activity. Adjusted data indicates the tabulation with their contributions removed.

TABLE 8
SCIENCE BACKGROUNDS OF LEADERS
IN SMALL, MEDIUM, AND LARGE SYSTEMS

Leader response n = 31

	Small Systems		Medium Systems		Large Systems	
	No.	%	No.	%	No.	%
Leaders with:						
Strong Science Background	13	56	22	67	19	76
Limited Science Background	6	26	8	24	6	24
Non-science Background	4	17	3	9	0	0
Totals	23	100	33	100	25	100

4. Leaders with Limited Science Background

The question of how effective the leadership training program is in preparing workshop leaders with limited science backgrounds can be answered in part on the basis of questionnaire response.

Table 9 illustrates the relationship between the major field of the leader and the number of workshops run. The variety of major fields represented indicates that about one-third of the leadership group has a limited science background. The table shows that about one-third of the IPS workshops and one-fourth of the PS II workshops were run by these leaders. It also shows that about one-third of the leaders reporting "no workshops run" were in this group. Individually, those with backgrounds in physics and chemistry, plus the one philosophy major, seem to have been most productive. Looking at the percentage involvement of the non-science majors, it is nearly constant, except for the small sample of PS II workshops. This tends to indicate that on the whole, a science major is not an important factor in whether leaders run workshops. But it must be noted that the quality of workshops is not indicated.

TABLE 9
NUMBER OF WORKSHOPS RUN BY LEADERS
WITH SCIENCE AND NON-SCIENCE MAJORS

	No. of Leader Responses	No. of Workshops Run By These Leaders		No. Reporting "No Workshops Run"
Science Majors:		IPS	PS II	
Biology	14	18		5
Physics	7	10	3	0
Chemistry	7	12		0
General Science	6	5		4
Mathematics	3	3		1
Anatomy and Physiology	2	3		0
Zoology	2	2		0
Geology	2	1		1
Subtotals	43	54	3	11
Non-Science Majors:				
Education	11	10	1	3
Physical Education	4	6		1
Philosophy	1	7		0
English	2	2		0
Psychology	2	2		1
Social Studies	1	1		0
Geography	1	0		1
Subtotals	22	28	1	6
Totals	65	82	4	17
Percent of Non-Science Majors	34%	34%	25%	35%

5. Summary

The necessity of an informed and supportive administration for successful in-service programs is apparent from both site visits and questionnaire response. On the one hand it appears that the closer contact possible in smaller systems should make the leader's role easier. But the data in Table 7 does not support this. This may be partly due to problems of regionalization, with contacts outside of the leader's own system limited by channels of communication. The educational background of the leaders themselves

is a variable that correlates somewhat with size of system, but does not appear to affect program implementation in terms of quantity. Because of the small number of leaders and workshops actually visited and the impersonality of the questionnaire response, it is not possible to assess the quality of these workshops directly.

C. The Teachers

1. Site Visits

The workshops are intended to promote teacher development in the spirit of the Physical Science Program. Participation in an effective workshop should help the teacher move away from the restricted traditional mode of science instruction. It should result in classrooms marked by interaction with and among students as they learn through investigations and discussions of their own data, by emphasis on total group effort in the collection and pooling of data, and by confidence building through judicious guidance of class activities. Site visits were undertaken in order to assess how successfully this is being accomplished through the leadership program.

Of the 43 individuals observed teaching IPS or PS II, 28 were workshop participants or leaders, three were workshop dropouts, four had NSF Institute or other training, and eight had no training. While the original intent was to visit only leader and participant classrooms, these additional teachers were included because they were in the same schools and influenced by workshop people.

On the basis of background information and observer assessment, the teachers observed were placed in one of the following groups: 1) open-experienced teachers; 2) traditional-experienced teachers; 3) open-beginning (1 - 3 years experience) teachers; 4) traditional-beginning teachers; 5) new (first year) teachers. "Open" indicated that classroom interaction with and among the students was encouraged, while "traditional" indicated that the class was teacher dominated. The observers made a further determination of whether the characteristics mentioned in the paragraph above were present in the classroom to a superior degree, an adequate degree, or were poor or lacking. Table 10 shows the distribution of these ratings by our observers.

TABLE 10
RATINGS OF TEACHER EFFECTIVENESS WITH IPS/PS II MATERIALS

Number of Teachers Observed: n = 44

	Experienced Teacher Open	Experienced Teacher Traditional	Beginner Teacher Open	Beginner Teacher Traditional	New Teacher
Leadership Program					
Superior	12*	0	1	0	1
Adequate	3	1	5	2	2
Poor	0	2	0	3	0
Other Training					
Superior	0	0			
Adequate	2	0			
Poor	1	1			
No Training					
Superior	0	0	1	0	0
Adequate	1	0	3	0	0
Poor	0	2	0	1	0

*Three of these 12 are leaders who are also teaching.

All of the superior teachers were leaders or participants except for one beginning teacher with no training. Records of site visits show that this individual was a naturally open teacher who handled his IPS classes remarkably well in an adverse situation. A trained IPS teacher in the same school offered only criticism, no support to the beginner. The trained teacher was seen as traditional in approach and not more than adequate with IPS classes by the observer. At other schools, workshop-trained teachers were found advising new IPS or PS II teachers. Where the trained teacher was superior, this seemed to be a constructive relationship whether the new teacher was in a workshop or not.

About half of the leadership-trained people, half of those with other training, and half of those with no training were rated adequate by the observers. Workshop training was not always successful in moving the individual away from a traditional teaching style, but a few traditional teachers have learned to work with the materials adequately in a traditional manner.

In one instance where the trained teacher was rated "adequate," the two teachers without workshops working with him were rated "poor," indicating a dilution of the Physical Science spirit there.

In the cases of poor performance of workshop participants, two situations were observed. One was the traditional-experienced teacher who seemed unable to change his ways. In the other situation, there seemed to be active resistance to the workshop influence on the part of relatively young teachers, with an attitude that said "I know this material and I know how to teach - what do I need a workshop for?" At one site, a group of three workshop dropouts was found, with one strong-minded individual influencing two teachers in his own school to react to the workshop in this way and to follow the example he provided in teaching IPS. At another site, two young teachers with the same self-satisfied attitude continued to attend the workshop because of department policy, but did not let it affect their classroom performance. All of these were doing poor or barely adequate jobs.

2. Training of IPS and PS II Teachers

Questionnaire response provided data on whether IPS and PS II teachers in the systems of leaders and in the schools of non-leaders were trained in NSF Institutes or local workshops, had other training or no training. Non-leaders were not asked the question in terms of their school system, because classroom teachers often are familiar only with conditions in their own school.

In Table 11, the types of training of IPS and PS II teachers are reported for small, medium, and large systems, and in totals. Looking at percentages, it is again apparent that small systems were making less use of trained leaders and were more dependent on NSF Institutes and other sources of training for their IPS and PS II teachers than were medium and large systems. The medium systems took more advantage of their trained leaders and had a lower percentage of untrained teachers in IPS and PS II classrooms. The large systems utilized their trained leaders and NSF Institutes quite extensively, but had untrained teachers in their IPS and PS II classes more often than the small or medium systems.

TABLE 11
TYPES OF TRAINING OF IPS/PS II TEACHERS IN LEADER'S SYSTEMS (1971-72)

No. of Leader Responses n = 70

Type of Training	IPS Teachers No.	IPS Teachers %	PS II Teachers No.	PS II Teachers %
Small Systems (< 1000 secondary students) n = 14				
NSF Institute	21	51.2	4	100.0
Local Workshop	9	22.0	--	--
Other Training*	3	7.3	--	--
No Training	8	19.5	--	--
Subtotals	41	100.0	4	100.0
Medium Systems (1000 - 5000 secondary students) n = 30				
NSF Institute	39	22.3	13	59.0
Local Workshops	105	60.0	9	41.0
Other Training*	4	2.3	--	--
No Training	27	15.4	--	--
Subtotals	175	100.0	22	100.0
Large Systems (> 5000 secondary students) n = 26				
NSF Institute	94	29.7	3	23.1
Local Workshop	128	40.4	6	46.1
Other Training*	8	2.5	--	--
No Training	87	27.4	4	30.8
All Systems n = 70				
NSF Institute	154	28.9	20	51.3
Local Workshop	242	45.4	15	38.4
Other Training*	15	2.8	0	--
No Training	122	22.9	4	10.3
Totals	533	100.0	39	100.0

*Within-school help, IPS pilot teacher training, State Department of Education workshops, College Course, etc.

In Table 12, the types of training in the participant's schools are tallied on the overall basis. This shows that where the leadership program existed, almost half were trained in the local workshop, the next largest group had no training, close to one-fifth had NSF Institute training, and a low percentage had other training.

TABLE 12
TYPES OF TRAINING OF IPS/PS II TEACHERS IN NON-LEADER'S SCHOOLS
(1971-72)

Non-leader Response n = 239 Schools

Type of Training	No. of Teachers	%
NSF Institute	121	19.2
Local Workshop	310	49.2
Other Training*	16	2.5
No Training	183	29.1
Total	630	100.0

*Within-school help, IPS pilot teacher training, State Department of Education workshops, College Course, etc.

3. Backgrounds of IPS and PS II Teachers

The question of whether the leadership training program is effective in terms of preparation of teachers with limited science background can be answered only to a limited degree. Questionnaire response on education and teaching experience provides data for a quantitative analysis. Assessment of the quality of preparation is limited by the small number of observations of teachers with limited science backgrounds.

Table 13 presents information on the education background of IPS and PS II teachers and Table 14 indicates the variety of their teaching experience. These illustrate the range of the non leaders' backgrounds without any basis for conclusions concerning effectiveness of the training with these individuals. It does appear that the same proportion (about one-third) of leaders and non-leaders have limited science backgrounds.

Five of the IPS classrooms visited had teachers with limited science background. These included Home Economics, Psychology, History, and two Education majors. Four were teaching in the spirit of IPS to an acceptable degree, and one was doing a superior job. From this the inference can be made that their workshop training was effective in preparing them to teach IPS. In order to generalize, a larger sample of classes taught by workshop participants with limited science background would have to be visited.

TABLE 13
EDUCATION BACKGROUND OF NON-LEADERS

Non-Leader Response n = 239

		No. of Majors	No. of Minors
Science			
Biology		73	20
Chemistry		51	35
General Science		35	33
Mathematics		13	44
Physics		12	13
Physical Science		9	11
Other Sciences*		18	10
	Subtotals	211	166
Non-Science			
Education		72	22
Physical Education		10	5
English		3	12
Humanities**		19	19
Miscellaneous***		16	5
	Subtotals	120	63
Totals		331	229

Non-science majors = 36%

Non-science minors = 27%

Some non-leaders indicated double majors

*Engineering, Zoology, Botany, Geology, Oceanography, Meteorology
**History, Social Studies, Economics, Languages, Psychology, Guidance, Philosophy, Religion, Political Science
***Business and Technical Subjects

TABLE 14
OTHER SUBJECTS TAUGHT BY IPS AND/OR PS II TEACHERS (1967-71)
Non-Leader Response n = 239

	IPS	PS II
General Science	61	6
Biology	49	9
Earth Science	42	5
Mathematics	39	2
Physical Science	30	4
Chemistry	30	10
Life Science	28	2
Physics	26	15
Health Education	12	0
Other Sciences*	8	1
Humanities**	27	1
Miscellaneous***	7	1

*ISM, Astroscience, ISCS, Medical History, Oceanography, Horticulture
**Latin, Social Studies, Art, Reading, Spelling, Music, English, Geography, Psychology, History
***Electronics, Sex Education, Photography, Physical Education, Computer Technology

4. Summary

Assessment of the effect of the leadership program on classroom implementation of IPS and PS II indicates that it is successful in promoting teacher development in the spirit of the program, on the basis of site visits to a limited number of IPS and PS II classes taught by workshop participants, and to a few other classes. There is some indication that it may be more successful than other methods of training, but the sample is too small to justify such an inference.

In terms of numbers of teachers trained in the workshops, questionnaire response indicates that where the leadership program exists, the leaders are providing training for about half of the IPS and PS II teachers overall. The proportion is highest in medium systems and lowest in small systems.

In terms of teacher response to the workshops, there is no indication that a limited science background makes any difference. To the contrary, on the basis of a small sample observed in the field, the workshops seem to be effective in preparing these limited science people to teach IPS. Also on the basis of site visits, the attitude of the individual coming to the workshop seems to be of more consequence than his background.

IV. IMPLEMENTATION OF PS II

A. Effect of Approach to the Schools

The implementation conference was the method of approaching school systems with a new course for both IPS and PS II. With IPS, invitations were sent to the school systems, asking that key people attend a conference for orientation to the new course, which was unfamiliar to most of them. With PS II, invitations were based on Prentice-Hall IPS user lists, and were sent directly to individuals in most cases. All of those attending the PS II conference represented school systems using IPS, and many were already familiar with its rationale and methodology. As we found in Figure 2, a higher proportion of system administrators and regional representatives were involved in the IPS conferences than in the PS II conferences. Those attending the PS II conferences were in one case predominantly science supervisory personnel, and in the other science staff from the schools. This difference in the level of professional involvement of those attending the conferences may be a salient point.

Timing of the implementation conferences differed for the two courses. With IPS, there were two conferences in 1965, the third pilot year, and a third conference in 1967, the final pilot year. Student enrollment in IPS had already reached 27,000 in 1965, and was over 200,000 at the time of the third conference. With PS II, the conferences were held in 1970, the fourth pilot year. But student enrollment was around 3000 at that time. It would be difficult to say whether the success of the IPS program made for effective conferences, or vice versa.

Data on Tables 15 and 16 show how information on the two courses reached leaders and participants in their schools. School administrators were the source of information for most on IPS, while with PS II most were informed through publications, an out-of-school source. On the whole, contact with IPS apparently was made more readily within the school, while exposure to PS II came from sources outside of school in most cases for both leaders and participants. This is a clear indication that information from the IPS implementation conferences was disseminated more extensively in the schools than information from the PS II conference.

Sources of support for adoption of ISP and of PS II are tabulated from leaders' point of view and participants' point of view in Figures 4 - 7. Perusal of these figures shows that the strongest supportive role was that of a particular teacher, except that the PS II teachers gave a little more weight to the role of the department head in adoption of PS II.

Figure 4 shows that there was increasing support for and decreasing opposition to IPS from its trial use to its current status. Figure 5 indicates that PS II is having more of a struggle in getting established. Although the PS II leader sample is small, Figure 5 might be interpreted to indicate that in some cases PS II was tried and met with disfavor. If this is the case, the difficulty most likely would not be with the implementation conference, but with problems in the school system. This is from the leaders' viewpoint, based on response to the more detailed questionnaire. Information from the non-leaders is less detailed and does not provide for differentation between trial use and current adoption.

TABLE 15
SOURCE OF INITIAL INFORMATION ON IPS

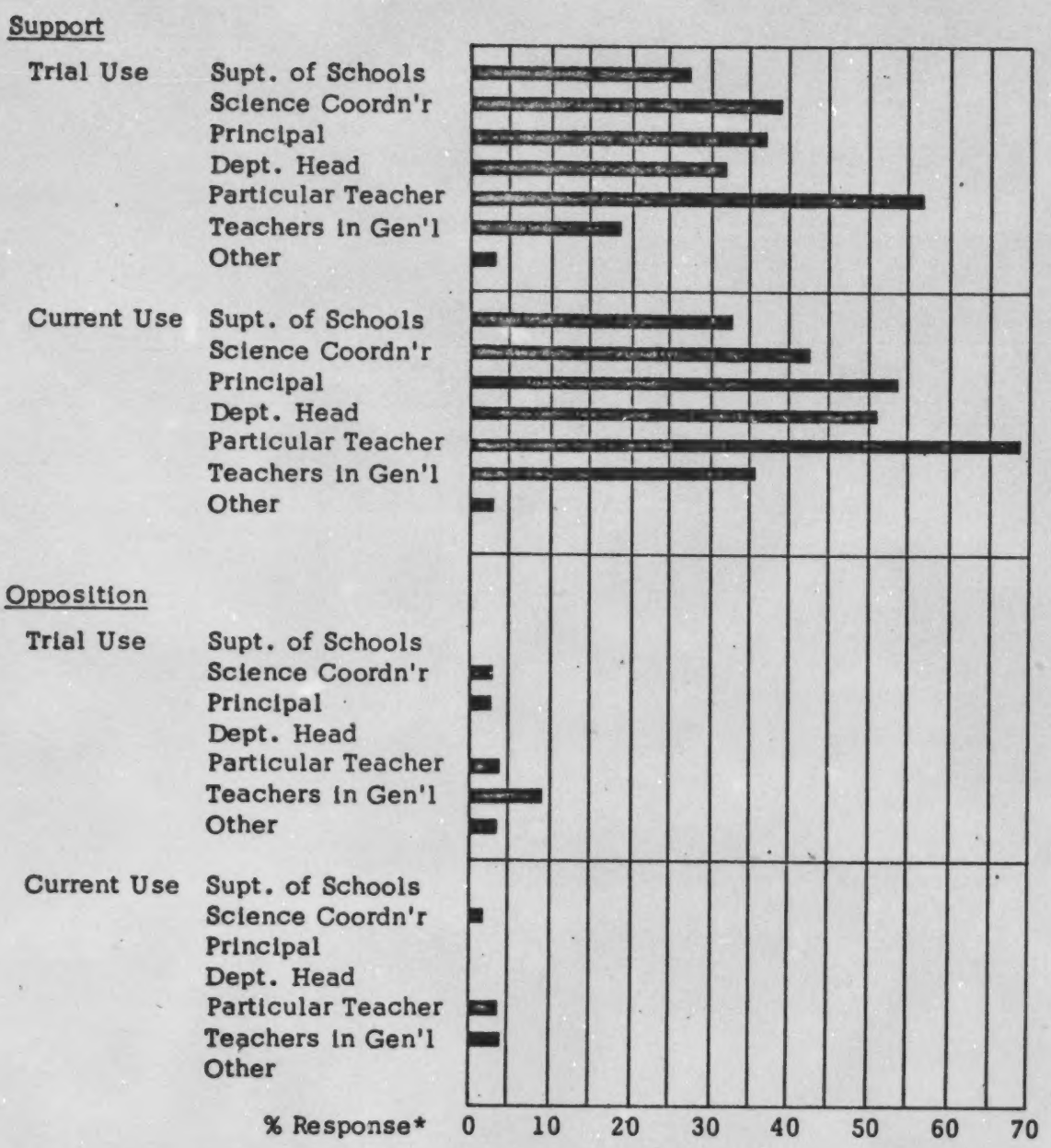
	Leaders (n = 81) % Response	Non-Leaders (n = 239) % Response
Within School		
Administrator	38	29
Pilot Teacher	4	12
Other Teacher	15	74
Assigned to Teach	1	7
Subtotals	58	74
Outside of School		
Publications	25	23
Meetings	20	16
Prentice-Hall	7	12
Physical Science Group	2	0
Leadership Conference	1	1
NSF	4	0
Subtotals	59	52
Totals	117*	126*

*Total percentages exceed 100% because there were a number of double responses.

TABLE 16
SOURCE OF INITIAL INFORMATION ON PS II

	Leaders (n = 91) % Response	Non-Leaders (n = 239) % Response
Within School		
Administrator	4	5
Pilot Teacher	7	8
Other Science Teacher	6	5
Subtotals	17	18
Outside of School		
Publications	16	9
Meetings	12	6
Prentice-Hall	11	8
Physical Science Group	5	1
Leadership Conference	1	0
Went looking	1	0
Subtotals	46	24
Totals	63*	42*

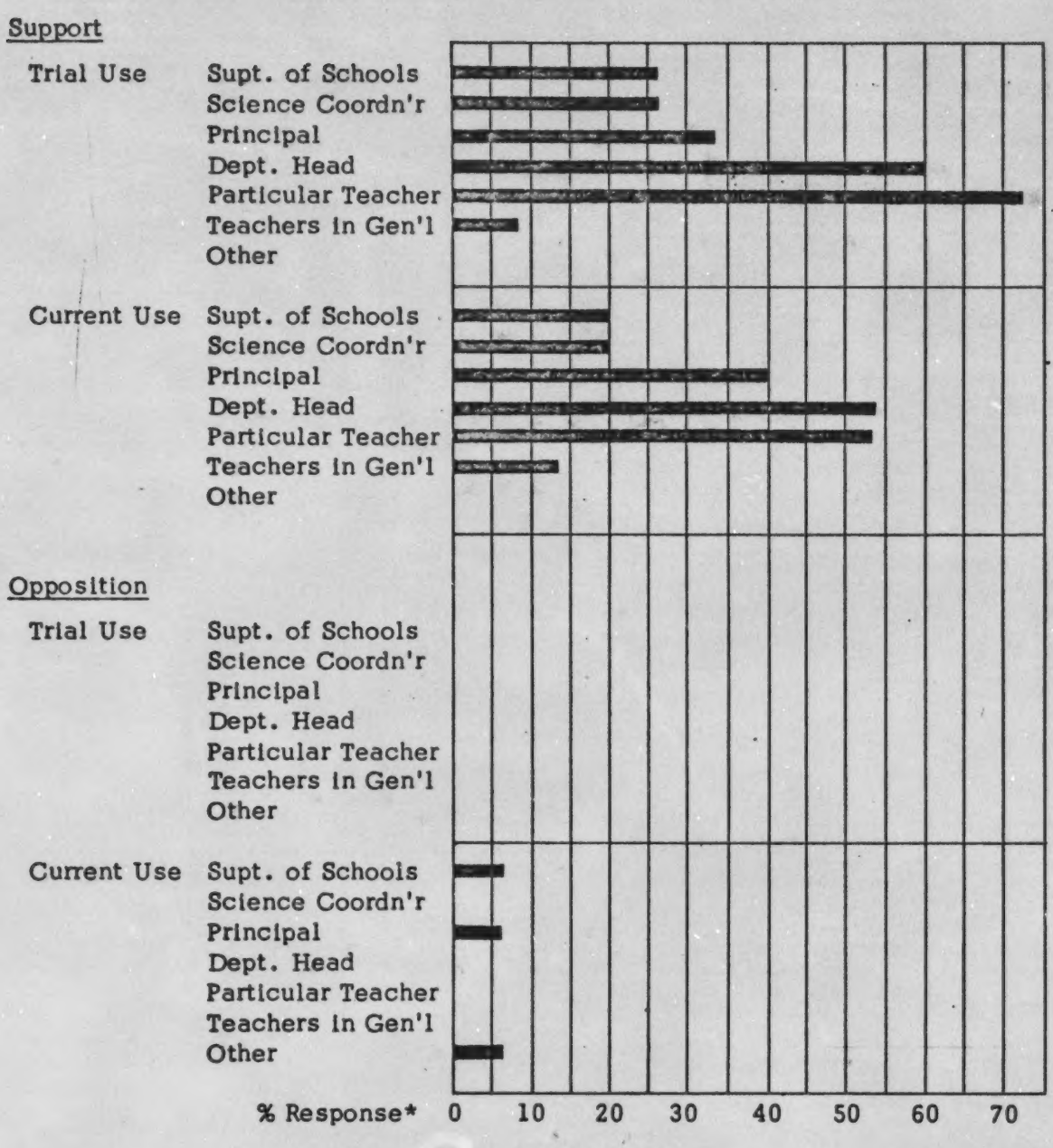
*Total percentages are less than 100% because there were a number who did not respond.



*IPS leaders usually identified three or four supportive individuals.

Figure 4. Leader's View of Support and Opposition for IPS Adoption

IPS Leader Response n = 67



*PS II leaders usually identified three or four supportive individuals.

Figure 5. Leader's View of Support and Opposition for PS II Adoption

PS II Leader Response n = 15

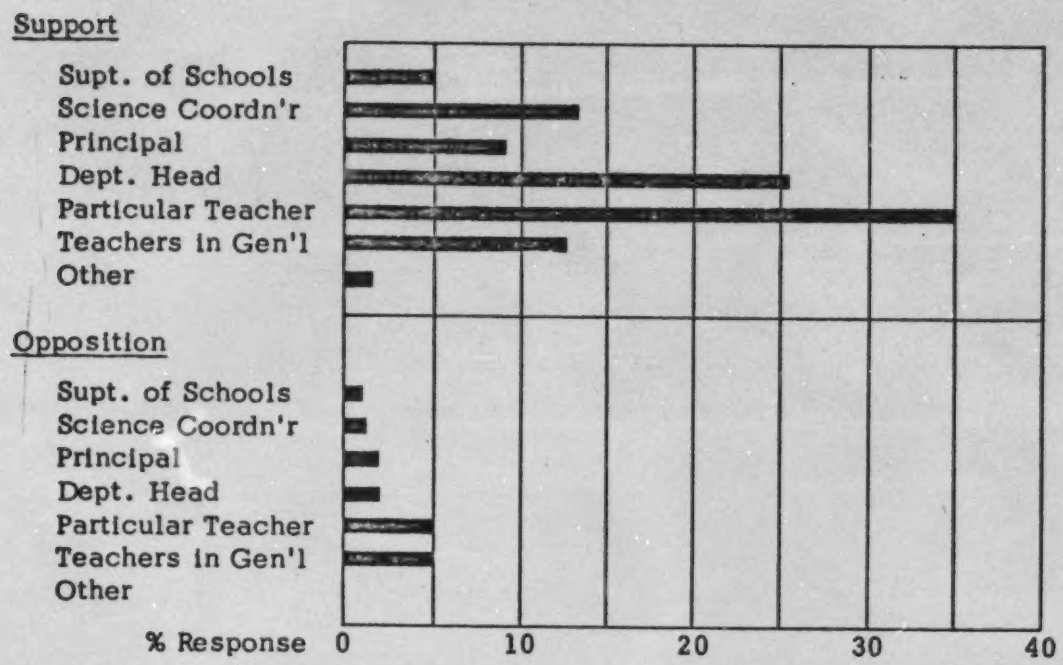


Figure 6. Teacher Perception of Support for IPS Adoption

Non-leader Response n = 239

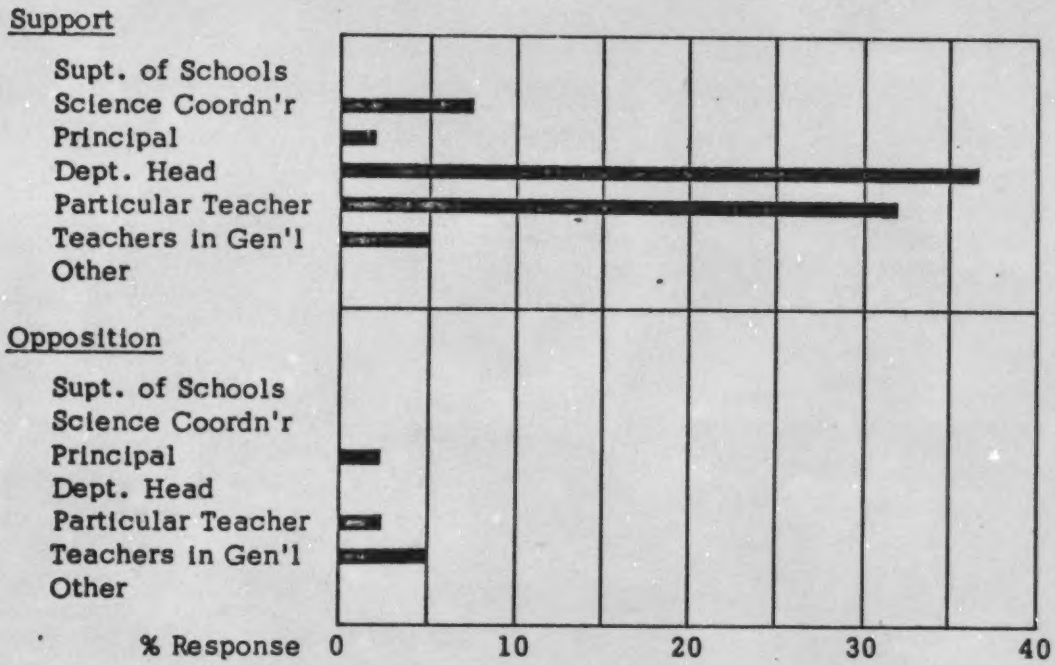


Figure 7. Teacher Perception of Support for PS II Adoption

B. Common Problems

General comments on common problems from leaders, participants, and from PS II teachers were analyzed and are presented on the basis of types of problems in Tables 17 - 19. These comments were in response to an open-ended question, and represent spontaneous reaction to the courses. Responses were submitted in unstructured format. The categories for analysis were created after initial perusal of the data.

Tables 17 - 19 show that implementation difficulties account for the majority of the problems identified by leaders, participants and PS II teachers alike. However, the PS II teachers concentrate their attention on this kind of problem, perhaps because the course is new in many places and these difficulties are more urgent to them.

Only six of the 204 participant responses (3%) were concerned with budget, while seven of the 81 leader responses (8%) mentioned this, and also seven of the 35 PS II teachers responses (20%). Different levels of awareness may account for some difference in perception on this item and others as well. But this is a definite indication that PS II is having greater budget problems than IPS.

The single problem mentioned most often by IPS participants and leaders is difficulty with math, but this appears to be a minor problem to PS II teachers. The slow-learner problem is also of minimum concern to PS II teachers.

It is interesting to note that 13 of the 35 PS II teachers (37%) stated that they had no problems. This did not occur in the leader or participant responses. It is possible that there are fewer student and teacher difficulties with PS II because there is more choice involved for both.

It might also be inferred that while IPS has been disseminated more broadly, the greater number of student and teacher problems indicate less understanding of the course by those teaching IPS as compared with PS II.

TABLE 17

LEADER'S VIEW OF COMMON PROBLEMS OF IPS AND PS II TEACHERS

Leader Response n = 81

Type of Problem	No. of Responses
Implementation	
Length of class period	14
Time for preparation and repair	13
Equipment	8
Facilities (storage)	7
Budget	7
Class size	6
Need for lab assistant	2
Subtotals	57
Student Ability	
Mathematics	21
Low-ability student	12
Science background	6
Individual needs	3
Subtotals	42
Other Student Problems	
Change of attitude	20
Behavior	5
Subtotals	25
Teacher Problems	
Change of philosophy	7
Need for more workshop training	4
Incentives and administrative support	4
Teacher turnover	1
Subtotals	16
Problems With the Course	
Criticism of content	6
Tests, evaluation	5
Subtotals	11
Total number of problems	151

TABLE 18

NON-LEADER'S VIEW OF COMMON PROBLEMS OF IPS AND PS II TEACHERS

Non-leader Response n = 239

Type of Problem	No. of Responses
Implementation	
Length of class period	31
Equipment	22
Time for preparation and repair	20
Class size	16
Facilities (storage)	10
Budget	6
Organization	6
Guidance	3
Need for lab assistant	3
Sequencing for PS II	1
Subtotals	118
Student Ability	
Mathematics	60
Science background	14
Reading	12
Individual needs	10
Subtotals	96
Other Student Problems	
Change of attitude	30
Behavior	25
Subtotals	55
Teacher Problems	
Change of philosophy	29
Need for more workshop training	9
Incentives and administrative support	5
Subtotals	43
Problems With the Course	
Criticism of content	26
Tests, evaluation	13
Subtotals	39
Total number of problems	351

TABLE 19
PS II PROBLEMS

PS II Teacher Response n = 35

Type of Problem		No. of Responses
Implementation		
Equipment and breakage		8
Budget		7
Facilities (storage)		4
Scheduling		4
	Subtotals	23
Student Problems		
Mathematics		1
No IPS		1
Slow learner		1
	Subtotals	3
Teacher Problems		
Lack of interest		1
	Subtotals	1
	Total number of problems	27
No Problems		13

C. Effect of Physical Separation of Junior/Senior High Schools

One of the problems in implementing PS II is sequencing. The desirable situation is one where students can move on from IPS to PS II without disruption of course continuity. A change from one school to another is common at some point in the junior-senior high progression, with the grade-level break usually occurring either between grades 8 and 9, or between grades 9 and 10.

This gives rise to the question whether the organizational structure of the school is a factor in the adoption of PS II. Table 20 presents data from questionnaire response, indicating that the point at which the grade-level break occurs does make a difference.

TABLE 20
EFFECT OF GRADE LEVEL BREAK ON PS II IMPLEMENTATION

Leader Response . n = 78

Small Systems (< 1000 secondary students)

	IPS Classes		PS II Classes	
	1971-72	1970-71	1971-72	1970-71
7 - 9 and 10 - 12 n = 17	36	41	0	0
7 - 8 and 9 - 12 n = 9	40	46	3	7
7 - 12 n = 2	15	10	2	1

(IPS/PS II grade level break 1971-72: χ^2 = 3.7 n.s.)

Medium Systems (1000 - 5000 secondary students)

	IPS Classes		PS II Classes	
	1971-72	1970-71	1971-72	1970-71
7 - 9 and 10 - 12 n = 13	168	164	3	1
7 - 8 and 9 - 12 n = 14	168	137	10	10
7 - 12 n = 1	8	9	0	1
Other (both 7 - 8 and 7 - 9) n = 6	98	93	0	0

(IPS/PS II grade level break 1971-72: χ^2 = 9.05 p = .05)

Large Systems (> 5000 secondary students)

	IPS Classes		PS II Classes	
	1971-72	1970-71	1971-72	1970-71
7 - 9 and 10 - 12 n = 12	440	425	1	2
7 - 8 and 9 - 12 n = 5	324	319	5	5
Other (both 7 - 8 and 7 - 9) n = 4	243	93	8	2
(7 - 8, 9, 10 - 12) n = 3	103	105	7	5
(6 - 8, 9 - 10, 11 - 12) n = 1	45	10	0	0

(IPS/PS II grade level break 1971-72: χ^2 = 22.27 p = .005)

Totals

	IPS Classes		PS II Classes	
	1971-72	1970-71	1971-72	1970-71
7 - 9 and 10 - 12	644	630	4	3
7 - 8 and 9 - 12	532	502	18	22
7 - 12	23	19	2	2
Other	489	301	15	7

(IPS/PS II grade level break 1971-72: χ^2 = 13.8 p = .005)

The χ^2 statistic was used to determine whether this is a significant difference within the limits of our sample size. In small systems, the difference is not significant. In medium and large systems and for the overall sample, the difference is significant beyond the .05 level, with the break between grades 8 and 9 more favorable to PS II adoption.

This led us to wonder whether the grade-level break affected the grade at which IPS and PS II were offered. Table 21 illustrates the distribution of IPS and PS II classes reported by our PS II teacher sample, with the limitation that in several cases where IPS is taught at a separate school, the grade level for IPS was not reported. Thus we have to infer in some instances that where PS II is taught in grade 9, IPS probably is taught in grade 8.

It is interesting to note that whether the break is between grades 8 and 9 or grades 9 and 10, about half of the schools have PS II in grade 9. Sometimes both IPS and PS II are offered in grade 9 at a given school. This is more common when the break is between grades 8 and 9, with some students coming from schools where IPS is offered in grade 8 and others from schools where it is not offered. This situation may also be due to tracking of students of different ability levels. In one instance, both IPS and PS II were offered at grade 9 as a combined course for average and better students, while low-ability students were offered a "slow" IPS only. There was also an instance where the courses were offered in combination at grade 11, with the students having the first five chapters of IPS in junior high.

On the whole there seemed to be more flexibility in the curricular structure with the grade 8/9 break in these cases. That is, in nine of the 17 cases students from more than one grade level were enrolled in IPS and/or PS II classes. With the grade 9/10 break, this occurred in three out of 14 cases. With the grade 8/9 break, there were three systems with a year or more gap between IPS and PS II. With the grade 9/10 break there was one instance of such a gap.

TABLE 21
EFFECT OF GRADE-LEVEL BREAK ON IPS/PS II CLASS DISTRIBUTIONS

PS II Teacher Response n = 38

	Grade	IPS	PS II
8/ 9 Grade-level break			
n = 17	7	0	0
	8	3	0
Subtotals		3	0
	9	10	9
	10	1	6
	11	0	2
	12	0	0
Subtotals		11	17
9/10 Grade-level break			
n = 14	7	1	0
	7 - 8	1	0
	8	5	0
	9	2	7
Subtotals		9	7
	10	0	1
	11	2	2
	12	0	0
	10 - 12	0	2
	11 - 12	1	2
		3	7
No break (Grades 7 - 12)			
n = 7	7 - 8	1	0
	8	3	0
	8 - 9	2	0
	9	1	6
	9 - 10	0	1
	10	0	0
	11	0	0
	12	0	0
Subtotals		7	7

Interview comments on the two PS II site visits indicated that PS II classes fare better when IPS is offered in the same building. Questionnaire response did not supply data to substantiate this. However, we feel it should be explored further.

In commenting on sequencing problems with PS II, the leaders described some of the organizational difficulties encountered. These are presented in Table 22, along with the participants' perceptions. From the leader's point of view, justification for the PS II course seemed to be the most obvious problem, in terms of conflict with other science offerings. The participants more frequently mentioned difficulties associated with the teaching itself.

D. Involvement of Guidance Department

The role of the Guidance Department in science course selection was explored in the questionnaires and in the on-site interviews with administrators as well as leaders and participants. The question of how students finally determine to take IPS or PS II was also asked.

A tabulation of the leaders' and non-leaders' responses on the role of the Guidance Department is presented in Table 23. Both groups agree that there is no role in about one-fifth of the schools. Specific information on the individual course appears to be part of only two items; "Recommends specific courses to students" and "Presents course descriptions as options." These two items account for 28% - 32% of the response, indicating that less than one-third of guidance departments are involved in science course selection on the basis of the merits of the course. Further perusal of the table shows that 30% - 40% of the remaining responses are in the areas of tracking, scheduling, or general counseling, while 10% of the leaders and almost 20% of the non-leaders are unacquainted with the role of their guidance departments in this area.

From the data presented in Table 24, it seems that guidance itself is minimal in its effect on student selection of IPS or PS II from the point of view of both leaders and non-leaders. The organizational tasks associated with tracking and required courses appear to be the major involvement of guidance.

We can see from Table 24 that IPS is now required for a large proportion of students. The decision to make it a requirement apparently does not involve the guidance department, on the basis of interviews on site visits. In one system with a science-oriented administration, involvement with IPS seemed to stem from the superintendent's office, and there was an active

TABLE 22
PS II SEQUENCING PROBLEMS

PS II Leader Response n = 15

	No.
Positive Comments	
Elective Grades 10 - 12	3
For accelerated 9th Grade	1
Would fit	1
No problem	1
Total	6
Negative Comments	
Biology - Earth Science conflict	6
No place (time) in curriculum	4
No need for PS II	2
Would require IPS in Grade 8	2
Guidance problem	1
Lack of IPS support	1
Not offered Grades 11 - 12	1
Funding	1
Total	18

PS II Teacher Response n = 20

Positive Comments	
Review Chapters 8 and 9, begin on Chapter 10	1
No problem	1
Total	2
Negative Comments	
Doesn't follow IPS immediately	3
IPS not prerequisite	2
Various IPS backgrounds	2
Poor IPS teaching, need to review	2
Poor guidance	1
Need for easier subject	1
Total	11

TABLE 23
ROLE OF GUIDANCE DEPARTMENT IN SCIENCE COURSE SELECTION

	Leader Response n = 70		Non-Leader Response n = 239	
	No.	%	No.	%
No role	14	20	44	18
No guidance department	--	--	6	2
Part of general counseling	14	20	26	11
Recommends specific courses to students	13	18	47	20
Presents course descriptions as options	10	14	20	8
Basis of test scores, tracking	9	13	23	10
Scheduling of courses	--	--	24	10
Miscellaneous*	3	4	--	--
Don't know, no answer	7	10	47	20

*Direct low ability to PS II; to those who ask.

TABLE 24
BASIS ON WHICH STUDENTS SELECT IPS/PS II

	Leader Response n = 70		Non-Leader Response n = 239	
	IPS	PS II	IPS	PS II
Required in 7th Grade	--	--	5	0
Required in 8th Grade	11	0	42	0
Required in 9th Grade	13	0	42	0
Required for graduation	0	0	2	7
Prerequisite for chemistry	0	0	2	0
Track (academic ability)	15	4	48	2
Elective (interest)	20	6	37	25
Guidance	0	0	4	0
Teacher recommended	4	4	2	2
Arbitrarily assigned	3	0	0	0
Required where offered*	4	0	0	0
Achievement in IPS	0	0	0	9
Don't know	0	0	8	0

*In multi-school systems

part taken in the decision at that level. In two other systems where IPS is required, the science department itself played the major role in course implementation, with administration endorsing their recommendations. The guidance department was not seen as involved in these developments.

In those systems visited where IPS is not required for all students and also those where PS II is offered, a variety of situations exist. The need for the guidance department to be more informed about courses offered becomes a matter of concern. This was expressed by central-office administrators, department heads, leaders, and participant teachers, with comments like these:

"There is a misunderstanding of the course by the guidance department."

"Guidance is not sufficiently involved in science course selection, partly because of proliferation of new courses."

"The number of choices is confusing."

"There is a need to speak to guidance personnel collectively to orient them to IPS."

"This year 25% of IPS students went on to PS II; last year it was 50%. This is due to poor guidance."

Mention was also made of conflict with traditional courses, the need to advise students and parents together, and the difficulty of having only one guidance counselor per thousand students. There were two instances where the high school science department had undertaken a presentation on science course offerings to junior high students and their parents.

The involvement of administrators in IPS and PS II adoption was explored in a previous section, and need not be discussed again. Some of the situations observed on the site visits provided insight on the results of the non-awareness or non-involvement of guidance and administrative personel. These include instances of segmentation of IPS and PS II to integrate them with a general science program; offering PS II as an open elective with or without IPS; scheduling practices that prevent IPS-PS II continuity or that do not recognize the needs of a lab-oriented course; misunderstanding of

the purpose of the in-service program. It is only fair to add that for every poor instance cited, the observer's records show other situations where aware administrators, and to some extent guidance personnel, have provided substantial assistance in the implementation of the Physical Science Program.

E. Summary

Implementation conferences for IPS and PS II had similar goals of orientation of school personnel to the new courses and dissemination of information about them. The IPS implementation conferences were addressed to administrators and regional educators along with science supervisory personnel; while the PS II conferences involved a higher proportion of science supervisors and department head and teaching staff. The implementation conference for IPS seems to have been more effective in disseminating initial information of the course into the schools than the PS II conference.

Other differences between IPS and PS II are apparent in support for adoption of the courses and in the problems identified in response. PS II is not accepted as readily as IPS. PS II teachers seem to have a greater proportion of implementation difficulties, including budget problems, and have minimum complaints of other kinds such as math, or slow-learner problems. This may indicate better understanding of the PS II course by those teaching it, even though it is less readily adopted than IPS.

Grade-level break between junior and senior high schools is a significant factor in the adoption of PS II in all but small systems, where, regardless of school organization, it is used less often. PS II is adopted more readily when the break is between grades 8 and 9. PS II is taught in grade 9 in about half of the schools in either case. With the grade 8/9 break, there seemed to be greater flexibility in having students from different grade levels in PS II classes, and also a gap of a year or more between IPS and PS II more often. Interview comments indicated that PS II fares better when IPS is taught in the same building, but we do not have data to support this. Some of the other factors affecting its implementation are conflict with other science offerings, various difficulties in fitting it into the schedule, and problems related to the student's knowledge of IPS.

It is apparent from questionnaire response and interview comments that the guidance department role in science course selection is limited. The need for more informed and involved guidance departments is a concern expressed by central office and by school administrators as well as by staff involved with IPS and PS II.

V. DISCUSSION AND RECOMMENDATIONS

A. Social Factors Affecting IPS and PS II Development

Thus far in this report we have concentrated our attention on specified aspects of IPS and PS II development, without consideration of the educational context in which they emerged. Some differences in the social climate with regard to science education when IPS was piloted and when PS II was piloted are apparent, and should be mentioned here.

Early work in IPS (1963-1965) coincided with the crest of a wave of innovation in secondary school science education. The public was very supportive of these efforts both financially and psychologically. Improved science education was viewed as a basic ingredient in the preservation of our society, and funds for new science courses were made available with little dissension from budget-conscious citizens.

IPS was made available to the schools at a point in time when many senior high schools were adopting the new programs, but the junior highs were still without an alternative to the traditional general science program. IPS provided this alternative, and was eagerly received by teachers and science supervisory personnel, and readily endorsed by administrators.

While PS II was in its developmental and pilot stages (1969-1971), a public reaction to the technological society was gathering strength. Many of our unsolved social ills were attributed to an over-involvement with the word of science and under-appreciation of more "human" endeavors. At the same time the economic condition of the nation was becoming strained, and the public was much more concerned about the amount of tax dollars going into education.

In addition, other junior high science curriculum projects were under way and offering competition to IPS, making it that much more difficult to justify PS II as part of a two-year sequence.

Thus PS II emerged as a non-conforming course in terms of the existing curriculum structure, at a time when public enthusiasm for science education had waned and when austerity had become the watchword of many school systems. To add to its difficulites, the traditional resistance to change in the educational program on the part of the average community seemed to provide more pressure against the introduction of a new course than it did against revision of an established one. PS II is in the position of having to demonstrate not only that it can provide a better science experience, but that it can meet a need that is not presently recognized at all.

B. Discussion of Findings

In view of these social factors it is not surprising that PS II exhibits a slower rate of growth than IPS. These factors probably affected the success of the PS II implementation conference in comparison with the IPS implementation conferences. Administrators and staff attending the IPS conferences could expect their subsequent recommendations to be welcomed in their school systems. Those attending the PS II conference were confronted not only with a non-conforming course but with a less receptive climate. We can surmise that some did not promote PS II in their systems to any appreciable degree.

The greater preponderance of administrators and regional educators at the IPS conferences and the involvement of more science teaching staff in the PS II conferences may also be a factor in their relative success in terms of dissemination of information about the courses.

Social factors undoubtedly influence the role of administrators in the piloting and adoption of a new course. In a receptive atmosphere such as IPS encountered, an administrator may endorse a new course without an in-depth understanding of its dimensions or commitment to its philosophy. Such an endorsement, based on the mutuality of interests of his community and his staff, may endure only as long as the atmosphere remains receptive. If the

administrator must justify the recommendations of his staff to a budget-conscious community, the quality of his own commitment to the new course become an important factor in its survival.

PS II in its trial stages seems to have been affected by the need for aware and informed administrators more than IPS was when it was tried. However, our study shows that while PS II is growing more slowly, the teachers appear to have fewer problems than IPS teachers in terms of attitudinal changes, caliber of students, and course content. A slower growth rate can allow for several positive outcomes: There is more time for adequate teacher preparation; teachers unfamiliar with the course or unwilling to teach it are less likely to have it assigned to them; the course is more apt to remain an elective, with a higher level of student interest in the classes; there is a lesser impact on tight budgets, allowing the course to demonstrate its value before adverse reaction develops; there is opportunity to try variations in the curriculum structure in ways that system-wide adoption precludes. All of these factors are affected by the quality of administrative involvement in a given school system.

The significance of the grade level break in PS II implementation is an interesting finding. Intuitively, we would expect a break between grades 9 and 10 would be more favorable, allowing for grade 8 IPS and grade 9 PS II in the same school, and eliminating a conflict with grade 10 biology. That this is not the case seems to reflect a greater curricular flexibility in the 7-8, 9-12 organization than in the 7-9, 10-12 organization. Our findings do show that significantly more systems with the 8/9 break adopt PS II.

Our data also shows that PS II is taught in grade 9 in about half of the schools in either case, but findings are inconclusive with regard to whether it makes a difference to have IPS and PS II both in the same school, apart from grade-level break. Further study of IPS/PS II class distributions and of variations in use of IPS and PS II materials is needed.

This study has found evidence that the leadership training program is effective in developing teaching skills attuned to classroom interaction, group

effort, and confidence building. The successful workshops seem to be characterized by the same methodology the teachers are expected to use in their classrooms, involvement with the materials for long enough periods of time, and the support of the local administration. Participants come to workshops with more positive attitudes when there is a prior orientation and some choice about involvement.

The relationship between leader success in promoting workshops and the size of the system suggests some possible program adjustments. Program applicants from the smaller systems might be encouraged to seek training through NSF Institutes, or other individual approaches. In the larger systems, the percentage of untrained teachers might be reduced if several trained leaders were available. In all cases, leadership training may need to devote more attention to development of cooperative arrangements between districts, the involvement of administrators, and the missionary role of the leader in his own system, in the region, and to some degree with state departments of education.

The premise on which the leadership training program was based - that the quality of personal interactions in the workshop was of greater importance than depth of the leaders' science background - was confirmed by this study. A limited science background does not appear to be a factor in the success of the leader in promoting workshops, or in the success of the teacher in the IPS or PS II classroom. The limitations of this study did not allow for analysis of the characteristics of a successful leader, but this finding supports the desirability of further investigation of this topic. Leadership applicants might be screened on the basis of scores on one of the standardized teacher attitude inventories.

Guidance departments appear to have little involvement in science course selection in many systems, and to have a detrimental effect on IPS and PS II enrollments in some instances where there is involvement. This study verifies the need for guidance personnel better informed about the dimensions of these courses. Non-standard uses of the courses were found at some sites, and described in some questionnaire comments. The Physical

Science Group may want to explore the nature and extent of these variations, and make some assessment of their merits, both for their own information and for the advisement of guidance personnel.

C. Summary of Recommendations

1. The implementation conference that involves a mix of administrative and science supervisory personnel is more effective than one involving primarily science supervisory and teaching staff, although the nature of the courses themselves may have affected dissemination.

2. Informed and aware administrators are essential to the success of a new course and of the in-service programs needed to implement it. Their commitment must stem from a real understanding of the dimensions of the course, going beyond simple endorsement of department recommendations.

3. The success of the leadership training program might be augmented by 1) more consideration of the problems of regionalization, especially for leaders from small systems, with a view to either helping them increase their skills in this regard or directing them to other types of training; 2) encouraging larger systems to train more leaders and to utilize their leaders in supportive roles with staff more extensively.

4. Course implementation of IPS may be strengthened by demonstration of the impact of its methodology in comparison with more traditional approaches. Implementation of PS II will depend to some extent on the demonstration of its ability to fill a need in the curriculum.

5. Further investigation of the characteristics of a successful leader may provide means of screening applicants more effectively, especially since strength of science background does not appear to be a relevant factor.

6. The advisement of guidance personnel concerning new courses needs to be improved, with a closer working relationship in non-standard uses of the courses desirable for the instruction of both curriculum innovators and users.

7. The slower growth rate of PS II may prove to be advantageous in the long run. Too rapid a growth rate may be associated with a shallow commitment to the values of the course.

APPENDICES

APPENDIX A

SAMPLE LETTERS OF CONTACT TO LOCAL SCHOOL SYSTEMS

1. Initiation of Site Visits A-1

2. Contact for Questionnaire Response A-2

physical science group
NEWTON COLLEGE OF THE SACRED HEART
885 CENTRE STREET • NEWTON MASSACHUSETTS 02159 • PHONE 617-969-6612

As part of an NSF project concerning PS II implementation, we are investigating various factors which influence the adoption of a new course like PS II, in contrast with the implementation of a course like IPS which has a natural place in existing curricula.

This is not a "market study" for PS II. Rather we are concerned with the general problem of the role, in curriculum innovation, of new courses that do not fit existing programs. Thus, information gained on PS II implementation would be useful for many different kinds of innovative courses.

We have attached a questionnaire that is being distributed to all participants of Leadership Conferences, and ask you to take a little time from your busy schedule to complete and return at your earliest convenience using the return envelope provided. All replies will be held in strict confidence. If a question refers to a school system, please answer from the viewpoint of your own school system. Pertinent experience with other school systems through your workshop contacts can be indicated in the "Additional comments" section at the end of the form. Do not, however, try to incorporate such experience in the body of the questionnaire. Consult with others if you really feel it is necessary.

We are aware of the many demands on your time and appreciate your willingness to help us by cooperating in this endeavor. A summary of our findings will be sent to you upon completion of the study.

Sincerely,

RWE:cer
Enclosure

Robert W. Estin
Supervisor of School Services

physical science group
NEWTON COLLEGE OF THE SACRED HEART
885 CENTRE STREET • NEWTON MASSACHUSETTS 02159 • PHONE 617-969-6612

We are currently involved in a program to evaluate relationships between teacher training and course implementation of the physical science courses, IPS and PS II. In addition to a general questionnaire survey involving several hundred teachers around the country, we wish to visit a limited number of school systems to observe IPS and/or PS II classes and to interview concerned administrators and teachers.

Because of the extensive local workshop in IPS that _____ has been directing, your school system is of particular interest to us. May we therefore include _____ on our visitation schedule during the next six to eight weeks?

We intend to give appropriate recognition to school systems cooperating in this project, but willmaintain the individual anonymity of each of the cooperating schools and teachers in the body of the final report.

Since our time is limited in formulating a schedule for visits, I would appreacite your prompt acknowledgement of your willingness to cooperate. I enclose a copy of this letter for you to countersign, indicating your approval. Please return it in the reply envelope provided.

Sincerely,

Robert W. Estin
Coordinator of School Services

RWE:k
Enc.

APPENDIX B

COPIES OF INSTRUMENTS

1. Long-form Questionnaire B- 1
2. Short-form Questionnaire B-11
3. Interview Schedule B-19
4. Observation Forms B-23

1. Long-form Questionnaire

IPS/PS II EVALUATION PROJECT: IMPLEMENTATION STUDY

FALL 1971

DIRECTIONS:

1. If a question refers to a school system, please answer from the viewpoint of your own school system.

2. Pertinent experience with other school systems through workshop or other contacts can be recorded in "Additional Comments" at the end of the form.

3. Consult with others only if you really feel it is necessary.

4. Please return the questionnaire as soon as possible. A prompt approximate answer is preferred to a delayed exact answer.

1. Mr. Mrs. Miss _____
   Last Name First Name Middle Name

2. Home Address _____
   Street

   _____
   City State Zip

3. Position: _____ School _____

   School System: _____
   City State

4. Number of schools in system:

   ____ 7 - 9 & ____ 10 - 12 ____ 7 - 12

   ____ 7 - 8 & ____ 9 - 12 Other: (specify) _____

5. Education:

College	Major	Minor	Degree	Date

6. NSF-funded institutes attended

Host Institution	Type of Institute (AY I, SI, ISI, CCSS, etc.)	Course

7. Are you currently teaching: IPS? [ ] Yes [ ] No PS II? [ ] Yes [ ] No

   If so, how many classes? IPS? _____ PS II? _____

   Total number of students? IPS? _____ PS II? _____

8. Not counting 1971-72, how many years have you taught IPS? _____ PS II? _____

9. Please list other subjects you have taught since Fall 1967. Indicate those currently taught with an asterisk(*).

Subject	Text	No. of Years

10. Which IPS/PS II institute or workshop have you attended?

	Year	Type (Summer, In-service, Combined)	Location
IPS?			
PS II?			

11. How did you first become aware of IPS/PS II?

	IPS	PS II
Publications	[ ]	[ ]
Science Meeting outside school	[ ]	[ ]
School Administrator (Specify:_____)	[ ]	[ ]
IPS/PS II Pilot Teachers	[ ]	[ ]
Other Science Teachers	[ ]	[ ]
Prentice-Hall Salesman	[ ]	[ ]
Other (Specify:_____)	[ ]	[ ]

12. How many IPS classes are there in your system during the current year 1971-72?_____. During 1970-71?_____.

13. How many of the current IPS teachers had IPS workshop training?

Number who attended NSF Institutes _____.

Number who attended Local IPS Workshop_____

Number who attended other than the above_____

(Explain)_____

Number without formal IPS training

14. How many IPS workshops have you lead? _____ PS II workshops?_____

Involving how many participants? IPS _____ PS II _____

What have been the problems in providing training for prospective IPS or PS II teachers in your district or region?_____

_____

If your system implemented IPS without any prior limited pilot program, check here [ ] and skip on to item 17.

If you are not familiar with details of your system's IPS pilot program, check here [ ] and skip on to item 17.

15. During what year(s) was IPS tried on a limited basis? _____

Number of teachers involved? _____

Number of IPS classes involved?_____

16. Indicate the role of each of the following in getting that limited pilot program formally adopted and implemented into the curriculum.

Individual	Role in Adoption	Role in Implementation
Superintendent of Schools	_____	_____
Science Coordinator or Supervisor	_____	_____
Department Head	_____	_____
Principal	_____	_____
Particular Teacher	_____	_____
Other (specify: _____)	_____	_____
Teachers in general	_____	_____

Use this rating scale to indicate attitude toward course.

Strong Support = +2
Mild Support = +1
Neutral or Mixed Feelings = 0
Mild Opposition = -1
Strong Opposition = -2

If your school system is currently involved in an IPS pilot program, skip on to item 19.

17. What best describes the current status of IPS in your school system?

[ ] Never used. (If you check here, skip on to item 19.)
[ ] No longer used. (If you check here, please elaborate on item 18. in item 50.)
[ ] Taken by some students in school
[ ] Used school wide, but not system wide
[ ] Used in some schools of system
[ ] Used system wide.

18. Indicate the role of each of the following in getting IPS to the current status you indicated in item 17. above.

Individual	Role in Adoption	Role in Implementation
Superintendent of Schools	_____	_____
Science Coordinator or Supervisor	_____	_____
Department Head	_____	_____
Principal	_____	_____
Particular Teacher	_____	_____
Other (specify: _____)	_____	_____
Teachers in general	_____	_____

Use this rating scale to indicate attitude toward course.

Strong Support = +2
Mild Support = +1
Neutral or Mixed Feelings = 0
Mild Opposition = -1
Strong Opposition = -2

19. If your system has never used PS II, check here [ ] and skip on to item 27.

20. How many PS II classes are there in your school system during the current year 1971-72?_____. During 1970-71?_____.

21. How many of the current PS II teachers had PS II workshop training?

Number who attended NSF Institutes _____

Number who attended Local PS II Workshop_____

Number who attended other than the above_____

(Explain)_____

Number without formal PS II training_____

22. Did your school system originally try (or is it now trying) PS II on a limited pilot basis? [ ] Yes [ ] No [ ] Don't know

If No or Don't know, skip on to item 25: if YES, continue with item 23 below.

23. During what year(s) was PS II tried on a limited basis?_____

Number of teachers involved in trial?_____

Number of PS II classes involved in trial?_____

24. Indicate the role of each of the following in getting your PS II pilot program formally adopted and implemented into the curriculum.

Individual	Role in Adoption	Role in Implementation
Superintendent of Schools	_____	_____
Science Coordinator or Supervisor	_____	_____
Department Head	_____	_____
Principal	_____	_____
Particular Teacher	_____	_____
Other (specify:_____)	_____	_____
Teachers in general	_____	_____

Use this rating scale to indicate attitude toward course.

Strong Support = +2
Mild Support = +1
Neutral or Mixed Feelings = 0
Mild Opposition = -1
Strong Opposition = -2

If your system is currently involved in a limited PS II pilot program, skip on to item 27.

25. What best describes the current status of PS II in your school system?

[ ] Never used. (If you check here, skip on to item 27.)

[ ] No longer used. (If you check here, please elaborate on item 26. in item 50.)

[ ] Taken by some students in school

[ ] Used widely in school, but not system wide

[ ] Used in some schools of system

[ ] Used widely in system

26. Indicate the role of each of the following in getting PS II to the current status you indicated in item 25 above.

Individual	Role in Adoption	Role in Implementation
Superintendent of Schools	_____	_____
Science Coordinator or Supervisor	_____	_____
Department Head	_____	_____
Principal	_____	_____
Particular Teacher	_____	_____
Other (specify: _____)	_____	_____
Teachers in general	_____	_____

Use this rating scale to indicate attitude toward course.

Strong Support = +2
Mild Support = +1
Neutral or Mixed Feelings = 0
Mild Opposition = -1
Strong Opposition = -2

27. About how many students are at each grade level in your system?

About how many students are taking IPS? PS II?

Grade Level	Total Number	No. in IPS	No. in PS II
8th	_____	_____	_____
9th	_____	_____	_____
10th	_____	_____	_____
11th	_____	_____	_____
12th	_____	_____	_____

28. Do all students have the option of taking IPS? _____

What are the alternatives? _____

29. On what basis is IPS chosen? _____ _____

30. What per cent take no science courses beyond IPS. _____

31. What science courses can students take after IPS?

[ ] Biology (tradiational) [ ] BSCS (yellow) [ ] CHEMStudy
[ ] Chemistry (traditional) [ ] BSCS (green) [ ] PSSC Physics
[ ] Physics (traditional) [ ] BSCS (blue) [ ] Harvard Project Physics
[ ] Other (specify: _____) [ ] PS II [ ] Other (_____)

32. What per cent of students who take IPS go on to PS II? _____

33. On what basis is PS II chosen?_____

34. How is the guidance department involved in a student's science course selection?

_____

35. Does the science department advise any or all students on science course selection?_____. On what basis?_____

36. How well has IPS fitted into the science program? Describe both positive and negative aspects_____

_____

37. Are there budget problems in implementing IPS?_____. PS II?_____. Please describe_____

_____

38. Has your Prentice-Hall representative been helpful in getting IPS/PS II started?

_____. Please describe_____

_____

39. In your own teaching in school (NOT in a teacher workshop), do you have a lab assistant, student teacher, or other supplementary personnel to help you either before and after or during your IPS/PS II classes?_____Please specify_____

_____

40. Do your own IPS/PS II classes always meet in the same room? [ ] Yes [ ] No

Is that room used for other courses? [ ] Yes [ ] No If so, what?_____

_____

41. Is there sufficient storage space for experiments in progress? [ ] Yes [ ] No

42. Is there sufficient equipment and supplies for several classes? [ ] Yes [ ] No

43. Do you have replacement problems? [ ] No problems. [ ] Equipment. [ ] Texts. [ ] Consumables. Describe_____

_____

44. Do students work in pairs in the lab? [ ] Yes [ ] No If no, now are they grouped, and why?_____

45. Do you feel there is adequate lab space? [ ] Yes [ ] No

46. What do you feel are the 2 or 3 most common problems encountered by IPS or PS II teachers?_____

_____

_____

47. What incentives do teachers have for involvement with IPS/PS II?

	Yes	No	Don't know
Personal satisfaction	[ ]	[ ]	[ ]
Prestige	[ ]	[ ]	[ ]
Salary step credit or increment	[ ]	[ ]	[ ]
Release time for workshops	[ ]	[ ]	[ ]
Stipend for attending workshops	[ ]	[ ]	[ ]
Merit rating	[ ]	[ ]	[ ]
Certification credit	[ ]	[ ]	[ ]

Other (explain)_____

_____

48. Describe the sequencing problems (if any) between IPS and PS II in your system.

_____

_____

49. What has been <u>your</u> role in introducing and implementing IPS/PS II in your school?

_____

_____

In your district?_____

_____

regionally?_____

_____

50. Additional comments (if applicable, please refer to question by number).

_____

_____

_____

_____

_____

_____

(continue on reverse)

2. Short-form Questionnaire

IPS/PS II IMPLEMENTATION STUDY

FALL 1971

DIRECTIONS:

1. Guess or approximate if you are not sure of any answer.

2. Answer with a question mark if you don't know.

3. If you wish to elaborate, use space in item 38. on page 5.

4. Please return this questionnaire as soon as possible.

A prompt response, however incomplete, is more useful than either a delayed one or none at all.

IPS/PS II IMPLEMENTATION STUDY

FALL 1971

1. Mr. Mrs. Miss _____
   Last Name First Name Middle Name

2. Home Address _____
   Street

   _____
   City Ctate Zip

3. Position:_____ School_____

   School System:_____
   City State

4. Number of schools in system:

   ____ 7 - 9 & ____ 10 - 12 ____ 7 - 12

   ____ 7 - 8 & ____ 9 - 12 Other: (specify)_____

5. Education: College Major Minor Degree Date

   _____

   _____

6. NSF-funded institutes attended

   Host Institution Type of Institute (AY I, SI, ISI, CCSS, etc.) Course

   _____

   _____

7. Which IPS/PS II institute or workshop have you attended:

   Year Type (Summer, In-service, Combined) Location

   IPS? _____

   PS II? _____

8. Are you currently teaching: IPS? [ ] Yes [ ] No PS II? [ ] Yes [ ] No

   If so, how many classes? IPS? _____ PS II? _____

   Total number of students? IPS? PS II? _____

9. Not counting 1971-72, how many years have you taught IPS? _____ PS II? _____

10. Please list other subjects you have taught since Fall 1967. Indicate those currently taught with an asterisk(*).

Subject	Text	No. of Years

11. How did you first become aware of IPS/PS II?

	IPS	PS II
Publications	[ ]	[ ]
Science Meeting outside school	[ ]	[ ]
School Administrator (Specify:_____)	[ ]	[ ]
IPS/PS II Pilot Teachers	[ ]	[ ]
Other Science Teachers	[ ]	[ ]
Prentice-Hall Salesman	[ ]	[ ]
Other (Specify:_____)	[ ]	[ ]

12. How many IPS classes are there in your school during the current 1971-72 year?

_____ During 1970-71?_____

13. How many of the durrent IPS teachers in your school had IPS workshop training?

Number who attended NSF Institutes_____

Number who attended Local IPS Workshop_____

Number who attended other than the above_____

(Explain)_____

Number without formal IPS training_____

14. Have you observed any correlation between IPS training and IPS classroom success among your colleagues? Describe._____

_____

_____

_____

15. In some schools, IPS has been adopted gradually with a limited pilot program preceding large scale usage. Other schools have used it on a large scale from the beginning.

Was IPS begun in your school on a limited scale first?

[ ] Yes If yes, when?_____ How many classes initially?_____
How many teachers initially?_____

[ ] No If no, was there a limited pilot in another school in your system?
[ ] Yes [ ] No

[ ] Don't know

16. Is IPS currently used in your school on a relatively large scale?

[ ] Yes If yes, when first used on large scale?_____ [ ] Don't know

[ ] No, still in limited pilot stage.

[ ] No, IPS terminated after pilot stage. Why?_____

_____

_____

17. Was IPS adoption in your school due to the particular efforts of one or two individuals?

[ ] Yes Identify by position, not by name_____

[ ] No

18. Was IPS adoption in your school strongly opposed by any individual(s)?

[ ] Yes Identify by position, not by name_____

[ ] No

19. For each grade in your school write the approximate enrollment in the table below:

Grade Level	Total Number	IPS Enrollment	PS II Enrollment
8th			
9th			
10th			
11th			
12th			

20. Do all students have the option of taking IPS?_____
What are the alternatives?_____

21. On what basis is IPS chosen?_____

22. What per cent take no science courses beyond IPS?_____

23. What science courses can students take after IPS?

[ ] Biology (traditional)	[ ] BSCS (yellow)	[ ] CHEMStudy
[ ] Chemistry (traditional)	[ ] BSCS (green)	[ ] PSSC Physics
[ ] Physics (traditional)	[ ] BSCS (blue)	[ ] Harvard Project Physics
[ ] Other (specify:_____)	[ ] PS II	[ ] Other (_____)

24. How is the guidance department involved in a student's science course selection?

_____

_____

25. Does the science department advise any or all students on science course selection?_____ On what basis?_____

_____

26. How well has IPS fitted into the science program? Describe both positive and negative aspects_____

_____

27. Are there budget problems in implementing IPS?_____. Please describe_____

_____

_____

28. Has your Prentice-Hall representative been helpful in getting IPS started?_____

_____. Please describe_____

_____

29. Do you have a lab assistant, student teacher, or other supplementary personnel to help you either before, during, or after your IPS classes?_____

_____

_____

_____

30. Do your own IPS classes always meet in the same room? [ ] Yes [ ] No

31. Is that room used for other courses and/or by other teachers? [ ] Yes [ ] No
If yes, describe_____

32. Is there sufficient storage space for experiments in progress? [ ] Yes [ ] No

33. Are there enough texts and materials for multiple sections? _____

34. Do you have replacement problems? [ ] Consumables [ ] Equipment [ ] Texts
[ ] No problems Describe_____

_____

35. Do students work in pairs in the lab? [ ] Yes [ ] No If no, how are they grouped, and why?_____

36. What do you feel are the 2 or 3 most common problems encountered by IPS teachers?_____

_____

_____

37. What incentives do teachers in your school have for involvement with IPS?

	Yes	No	Don't know
Personal satisfaction	[ ]	[ ]	[ ]
Prestige	[ ]	[ ]	[ ]
Salary step credit or increment	[ ]	[ ]	[ ]
Release time for workshops	[ ]	[ ]	[ ]
Stipend for attending workshops	[ ]	[ ]	[ ]
Merit rating	[ ]	[ ]	[ ]
Certification credit for workshops	[ ]	[ ]	[ ]

38. Additional comments (if applicable, please refer to question by number).

_____

_____

_____

_____

_____

If your school has PS II, please continue on the next page. If PS II is not taught at your school, this concludes the questionnaire.

Answer items below only if your school uses PS II.

39. When was PS II first used in your school?_____

	Initial Year of PS II	Current Year 1971 - 72
Number of PS II classes	_____	_____
Number of PS II students	_____	_____
Number of PS II teachers	_____	_____

40. What is the IPS/PS II experience and background of each current PS II teacher in your school?

	Numbers of years teaching (Do not count 1971 - 72)		Kind of workshop training (NSF, local, none, etc.)	
	IPS	PS II	IPS	PS II
Teacher No. 1	_____		_____	
Teacher No. 2	_____		_____	
Teacher No. 3	_____		_____	
Teacher No. 4	_____		_____	

41. Earlier in items 17. and 18. you described (by position) any strong local proponents and opponents of IPS. Does PS II differ from IPS in this respect?_____

_____

42. About what per cent of IPS students go on to PS II?_____

43. On what basis do they choose (or are selected for) PS II?_____

_____

44. Describe any sequencing problems (if any) between IPS and PS II_____

_____

_____

_____

45. Are there any other problems specifically relating to PS II (budgeting, space, equipment, scheduling, etc.)?_____

_____

_____

_____

_____

IPS/PS II EVALUATION PROJECT: Interview Form Date_____ Interviewer _____

Name_____ Position_____ School_____ City_____

1. How did you first become aware of IPS? PS II ?_____

_____

_____

_____

2. IPS Development in your school:

Pilot

____ None

____ Don't know

____ In another school in system

____ Yes. When?_____

No. of classes?))_____

No. of teachers ?_____

Implementation

___ Not yet. Still in pilot.

____ IPS Terminated after pilot. Why?_____

____ Implemented. When ?_____

	First year	Now
No. of classes	_____	_____
No. of teachers	_____	_____

3. Proponents and Opponents?

	Pilot		Implementation	
Individual	Formal Adoption	Actual Implementation	Formal Adoption	Actual Implementation
Superintendent of Schools	_____	_____	_____	_____
Science Coordinator or Supervisor	_____	_____	_____	_____
Department Head	_____	_____	_____	_____
Principal	_____	_____	_____	_____
Particular Teacher	_____	_____	_____	_____
Other (specify: _____)	_____	_____	_____	_____
Teachers in general	_____	_____	_____	_____

4. Training of IPS Teacher colleagues.

	PS II Teacher Colleagues
No. who attended NSF Institutes _____	_____
No. who attended local workshop _____	_____
No. who attended other (specify:_____)_____	_____
No. without formal IPS training _____	_____

5. Does the relative classroom success of your IPS colleagues seem to correlate with their IPS training ? In what ways ? _____

_____

_____

_____

6. Is PS II used in your school ? __ Yes __ No . If No, skip on to item 9.

7. PS II Development in your school:

Pilot	Implementation
None	Not yet. Still in pilot.
Don't know	PS II Terminated after pilot. Why ?_____
In another school in system	Implemented. When ?_____
Yes. When ?_____	
No. of classes ?))_____	
No. of teachers ?_____	

	First year	Now
No. of classes	_____	_____
No. of teachers	_____	_____

8. Proponents and Opponents ?

	Pilot		Implementation	
Individual	Formal Adoption	Actual Implementation	Formal Adoption	Actual Implementation
Superintendent of Schools	_____	_____	_____	_____
Science Coordinator or Supervisor	_____	_____	_____	_____
Department Head	_____	_____	_____	_____
Principal	_____	_____	_____	_____
Particular Teacher	_____	_____	_____	_____
Other (specify: _____)	_____	_____	_____	_____
Teachers in general	_____	_____	_____	_____

9. About how many students at each grade level in your system are taking IPS and PS II?

Grade Level	Total Number	No. in IPS	No. in PS II
8th	_____	_____	_____
9th	_____	_____	_____
10th	_____	_____	_____
11th	_____	_____	_____
12th	_____	_____	_____

10. Do all students have the option of taking IPS?_____
What are the alternatives?_____

11. On what basis is IPS chosen?_____

12. What per cent take no science courses beyond IPS._____

13. What science courses can students take after IPS?

[ ] Biology (tradiational) [ ] BSCS (yellow) [I CHEMStudy
[ ] Chemistry (traditional) [ ] BSCS (green) [ ] PSSC Physics
[ ] Physics (traditional) [ ] BSCS (blue) [ ] Harvard Project Physics
[ ] Other (specify: _____) [ ] PS II [ ] Other (_____)

14. What per cent of students who take IPS go on to PS II?_____

15. On what basis is PS II chosen?_____

16. How is the guidance department involved in a student's science course selection?

_____

17. Does the science department advise any or all students on science course selection?_____ On what basis?_____

18. How well has IPS fitted into the science program? Describe both positive and negative aspects_____

_____

19. Are there budget problems in implementing IPS?_____. PS II?_____. Please describe_____

_____

20. Has your Prentice-Hall representative been helpful in getting IPS/PS II started?
_____. Please describe_____

_____

21. Do you have a lab assistant, student teacher, or other supplementary personnel to help ypu either before, during, or after your IPS/PS II classes? _____

_____

_____

22. Do your own IPS/PS II classes always meet in the same room? [ ] Yes [ ] No

23. Is that room used for other courses? [ ] Yes [ ] No If so, what?_____

_____

24. Is there sufficient storage space for experiments in progress? [ ] Yes [ ] No

25. Is there sufficient equipment and supplies for several classes? [ ] Yes [ ] No

26. Do you have replacement problems? [ ] No problems. [ ] Equipment. [ ] Texts. [ ] Consumables. Describe_____

_____

27. Do you feel you have adequate lab space and facilities?_____

_____

28. What are the 2 or 3 most common problems encountered by IPS or PS II teachers ? Do you have them ? _____

_____

_____

_____

_____

29. Do you feel the following were incentives which influenced colleagues to become involved with IPS or PS II ?

	Yes	No	Don't know
Personal satisfaction	[ ]	[ ]	[ ]
Prestige	[ ]	[ ]	[ ]
Salary step credit or increment	[ ]	[ ]	[ ]
Release time for workshops	[ ]	[ ]	[ ]
Stipend for attending workshops	[ ]	[ ]	[ ]
Merit rating	[ ]	[ ]	[ ]
Certification credit	[ ]	[ ]	[ ]

Other (explain)_____

_____

30. Describe the sequencing problems (if any) between IPS and PS II in your system.

_____

_____

IPS/PS II EVALUATION PROJECT: CLASSROOM OBSERVATION FALL 1971

OBSERVER _____ DATE_____

TEACHER _____ TIME_____

SCHOOL _____ TOPIC.....WHERE IN COURSE_____

LOCATION_____ PRE-LAB [ ]

GRADE LEVEL [ ]8 [ ]9 Other:_____ LAB [ ]

ABILITY LEVEL [ ]ungrouped [ ]hi [ ]low POST-LAB [ ]

Number of Students _____ HDL [ ]

Number of IPS classes for teacher _____ GROUPING OF 2 [ ] OR OTHER _____

Number of classes (IPS/other) use room _____

Number of teachers (IPS/other) use room _____

Room Layout:

FACILITIES:
SINKS [ ]_____
PROJECTOR [ ]_____
BLACKBOARDS [ ]_____
SUPPLIES [ ]_____
EQUIPMENT [ ]_____
STORAGE [ ]_____

General Teacher Behavior

1. Encourages students' reasoning	1	2	3	4	5	Provides answers to students unnecessarily
2. Shows pleasure	1	2	3	4	5	Shows displeasure
3. Seems confident in teaching role	1	2	3	4	5	Seems uncertain of own competence
4. Stimulates feeling for science as an exciting human activity	1	2	3	4	5	Conducts activity in a shell routine manner
5. Recognizes differing activities of students & provides for individual needs	1	2	3	4	5	Expects all students to adhere to planned schedule
6. Shows enthusiasm for subject	1	2	3	4	5	Seems apathetic
7. Talks to students on an equal basis	1	2	3	4	5	Talks down to students
8. Gives encouragement to group effort and analytic thinking	1	2	3	4	5	Reserves praise for achievement and following of rules

Questions: _____

_____

PRE-LAB

TEACHER_____

OBSERVER_____

DATE_____

Teacher Behavior

1.	Motivates students to take initiative with lab	1	2	3	4	5	Directs students in lab work
2.	Promotes responsible lab techniques	1	2	3	4	5	Allows slipshod lab procedures
3.	Guides class discussion	1	2	3	4	5	Stifles class discussion
4.	Maintains control in democratic manner	1	2	3	4	5	Exerts rigid control
5.	Is responsive to students' needs and difficulties	1	2	3	4	5	Avoids interactions with students
6.	Listens to and utilizes students' suggestions and ideas	1	2	3	4	5	Permits only one way of doing and thinking -- his
7.	Is physically close to students	1	2	3	4	5	Remains at a distance from students
8.	Frequently asks students to observe or hypothesize	1	2	3	4	5	Usually makes statement or draws conclusion for students
9.	Helps student assess procedures and standards	1	2	3	4	5	Tells student procedures and standards

PRE-LAB

Student Behavior

1.	Alert	1	2	3	4	5	Apathetic
2.	Responsible	1	2	3	4	5	Obstructive
3.	Confident	1	2	3	4	5	Uncertain
4.	Shows initiative	1	2	3	4	5	Depend on teacher direction
5.	Volunteer in response to questions	1	2	3	4	5	Do not volunteer in response to questions
6.	Student to student exchange of ideas high (relative to subject)	1	2	3	4	5	Low
7.	Student to teacher exchange of ideas high	1	2	3	4	5	Low
8.	Initiate topics for discussion and experiment	1	2	3	4	5	Do not initiate topics for discussion and experiment
9.	Share thoughts and experiences with peers	1	2	3	4	5	Tend to work in isolated units
10.	Responsible atmosphere	1	2	3	4	5	Chaotic atmosphere
11.	Shows keen desire to learn	1	2	3	4	5	Are unmotivated

LAB

TEACHER_____

OBSERVER_____

DATE_____

Teacher Behavior

1.	Motivates students to take initiative with lab	1	2	3	4	5	Directs students in their lab work
2.	Promotes responsible lab techniques	1	2	3	4	5	Allows slipshod lab procedures
3.	Makes critical comment impartially and calmly	1	2	3	4	5	Is excitable and erratic in responding to error
4.	Is physically close to students	1	2	3	4	5	Remains at a distance from students
5.	Frequently asks students to observe or hypothesize	1	2	3	4	5	Usually makes statement or draws conclusion for students
6.	Is responsive to students' needs and difficulties	1	2	3	4	5	Avoids interaction with students
7.	Helps students assess procedures and standards	1	2	3	4	5	Tells students procedures and standards

LAB

Student Behavior

1.	Alert	1	2	3	4	5	Apathetic
2.	Responsible	1	2	3	4	5	Obstructive
3.	Confident	1	2	3	4	5	Uncertain
4.	Shows initiative	1	2	3	4	5	Depnd on teacher direction
5.	Volunteer in response to questions	1	2	3	4	5	Do not volunteer in response to questions
6.	Student to student exchange of ideas high (relative to subject)	1	2	3	4	5	Low
7.	Student to teacher exchange of ideas high	1	2	3	4	5	Low
8.	Initiate topics for discussion and experiment	1	2	3	4	5	Do not initiate topics for discussion and experiment
9.	Are competent in use of lab materials	1	2	3	4	5	Are slipshod in use of lab materials
10.	Show keen desire to learn	1	2	3	4	5	Are unmotivated
11.	Cooperate with lab partners	1	2	3	4	5	One student dominates in most groups
12.	Share thoughts and experiences with peers	1	2	3	4	5	Tend to work in isolated units
13.	Responsible atmosphere	1	2	3	4	5	Chaotic atmosphere

POST-LAB

TEACHER_____

OBSERVER_____

DATE _____

Teacher Behavior						
1. Guides class discussion	1	2	3	4	5	Stifles class discussion
2. Guides students to answer consistent with their own data	1	2	3	4	5	Judges statement to be right or wrong
3. Maintains control in democratic manner	1	2	3	4	5	Exerts rigid discipline
4. Is responsive to students needs and difficulties	1	2	3	4	5	Avoids interaction with students
5. Listens to and utilizes students' suggestions and ideas	1	2	3	4	5	Permits only one way of doing and thinking -- his
6. Develops conclusions based on class results	1	2	3	4	5	Bases conclusions on teacher guide data
7. Makes critical comment impartially and calmly	1	2	3	4	5	Is excitable and erratic in responding to error
8. Is physically close to student	1	2	3	4	5	Remains at distance from student
9. Frequently asks students to observe or hypothesize	1	2	3	4	5	Usually makes statements or draws conclusion for students

POST-LAB

Student Behavior

1.	Alert	1 2 3 4 5	Apathetic
2.	Responsible	1 2 3 4 5	Obstructive
3.	Confident	1 2 3 4 5	Uncertain
4.	Shows initiative	1 2 3 4 5	Depend on teacher direction
5.	Volunteer in response to questions	1 2 3 4 5	Do not volunteer in response to questions
6.	Student to student exchange of ideas high (relative to subject)	1 2 3 4 5	Low
7.	Student to teacher exchange of ideas high	1 2 3 4 5	Low
8.	Initiate topics for discussion and experiment	1 2 3 4 5	Do not initiate topics for discussion and experiment
9.	Defend conclusions based on own data	1 2 3 4 5	Defers to teacher
10.	Develop concepts from experimental results	1 2 3 4 5	Depend on teacher explanation
11.	Show keen desire to learn	1 2 3 4 5	Are unmotivated
12.	Analyzes results through comparisons of all data collected	1 2 3 4 5	Does not analyze results
13.	Share thoughts and experiences with peers	1 2 3 4 5	Tend to work in isolated units
14.	Responsible atmosphere	1 2 3 4 5	Chaotic atmosphere

APPENDIX C

x^2 TABULATION

1. x^2 Tabulation C-1

χ^2 ON IPS/PS II GRADE LEVEL BREAK 1971-1972

$\chi^2 = \frac{(o - e)^2}{e}$ (o - observed, e - expected)

	IPS^o	PS II	IPS^e	PS II	
Small Systems					
7-9/10-12	36	0	34	2	
7-8/ 9-12	40	3	41	2	
7-12	15	2	16	1	
	χ^2 = 3.70		n.s.		df = 2
Medium Systems					
7-9/10-12	168	3	166	5	
7-8/ 9-12	168	10	173	5	
7-12	8	0	8	0	
Other	98	0	95	3	
	χ^2 = 9.05		p = .05		df = 3
Large Systems					
7-9/10-12	440	1	433	8	
7-8/ 9-12	324	5	325	4	
Both	243	8	247	4	
7-8/9/10-12	103	7	108	2	
6-8/9-10/11-12	45	0	44	1	
	χ^2 = 22.27		p = .005		df = 4
Total Leader Response					
7-9/10-12	644	4	633	15	
7-8/ 9-12	532	18	538	12	
7-12	23	2	24	1	
Other	489	15	493	11	
	χ^2 = 13.8		p = .005		df = 3